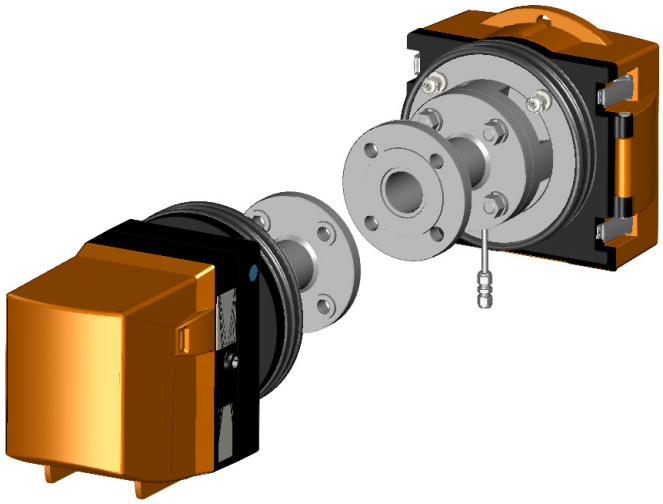
OPERATING INSTRUCTIONS

GM700
TDLS Analyzer for NH_3, HF, HCl or O_2
Process version

Installation
Operation
Maintenance



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Original Documents
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Warning Symbols

IMMEDIATE HAZARD
of severe injuries or death

Hazard (general)
(Please consult the documentation)

Hazard by corrosive substances

Hazard by voltage

Hazard by unhealthy substances

Hazard by toxic substances

Hazard by laser radiation

Hazard by high temperature or hot surface

Danger of explosion in hazardous areas.

Warning Levels / Signal Words

DANGER
Risk or hazardous situation which *will* result in severe personal injury or death.

WARNING
Risk or hazardous situation which *could* result in severe personal injury or death.

CAUTION
Hazard or unsafe practice which *could* result in personal injury or property damage.

NOTICE
Hazard which *could* result in property damage.

Information Symbols

Information about the use in potentially explosive atmospheres

Important technical information for this product

Important information on electric or electronic functions

Nice to know

Supplementary information

Link to information at another place

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GM700

1 Safety Information

Main hazards
Main operating information
Intended use
Responsibility of user

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1.1 Main hazards

Important safety information in short form.

Operational safety

DANGER: Hazards through defective device

The GM700 is likely to be unsafe when it:

- Has been penetrated by moisture.
- Has been stored or operated under irregular conditions.

When safe operation is no longer possible:

► Put the GM700 out of operation, separate all connectors from the power supply and secure against unauthorized start-up.

WARNING: Hazard by voltage

► Pay careful attention to power supply connections.

► Do not interrupt protective conductor connections.

WARNING: Hot surfaces when enclosure open

Pay attention to hot surfaces on the measuring cell when opening the GM700 enclosure.

WARNING: Danger of explosion in hazardous areas.

⊗ Do not open the process windows without proper clearance for that. Flammable or potentially explosive gas, or gas that may form explosible gas when mixed with atmosphere may escape from the duct.

WARNING: For systems with purge gas:

⊗ Do not shut off or disconnect the purge gas for any other reason than maintenance work that requires this.

WARNING: Eye injuries possible due to laser radiation
Observe all information on laser radiation in these Operating Instructions.

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1.2 Main operating information

1.2.1 Protection against hazards through gases

WARNING: Hot and/or aggressive sample gases

- ► Wear suitable protective clothing and mask when using hot and/or aggressive sample gases resp. with high dust loads.
- ► Never open the enclosure or switch off the purge gas feed without taking appropriate protective measures when the duct is pressurized.

WARNING: Switch off purge gas supply when isolation valve is closed

In case an isolation valve is installed, the purge gas supply must be switched OFF whenever the valve is closed to prevent window damage due to overpressure.

WARNING: Toxic and caustic substances in parts in contact with sample gas

- GM700 parts in contact with sample gas can contain toxic and caustic substances depending on the sample gas composition.
- When fitted in the measuring device, the reference cuvette contains the respective gases to be measured. These gases must not escape.
  Special care must be taken with the **GME700-2 (HF)** because it not only contains gaseous HF but also a certain amount of liquid (max. 0.1 g HF for 8 cm cells, max. 0.02 g for 1 cm cells). HF/hydrofluoric acid is extremely toxic and caustic. It is imperative to avoid inhaling or skin contact at all times. Particularly when there are indications of leaks or defects, wear protective clothing (protective goggles, latex gloves) and carry out work in a well ventilated room/area. Never open the cuvette under any circumstances. Check replacement cuvettes for any possible transport damage.
- Handle with care when test gases are used:
  - ► When handling HF, keep an HF emergency set (including calcium gluconate gel) available.

- ► Before working on the gas path, ask the operator which gases have been applied to the GM700.
- ► Ask the operator whether, and how, the GM700 gas path has been cleaned.
- ► If necessary, clean the gas path with a suitable method.
- ► In case of doubt, take appropriate protective measures before working on the gas path: Ensure adequate ventilation at the workplace or work under a vent. Wear protective goggles or a safety mask, protective gloves and acid-proof protective clothes.

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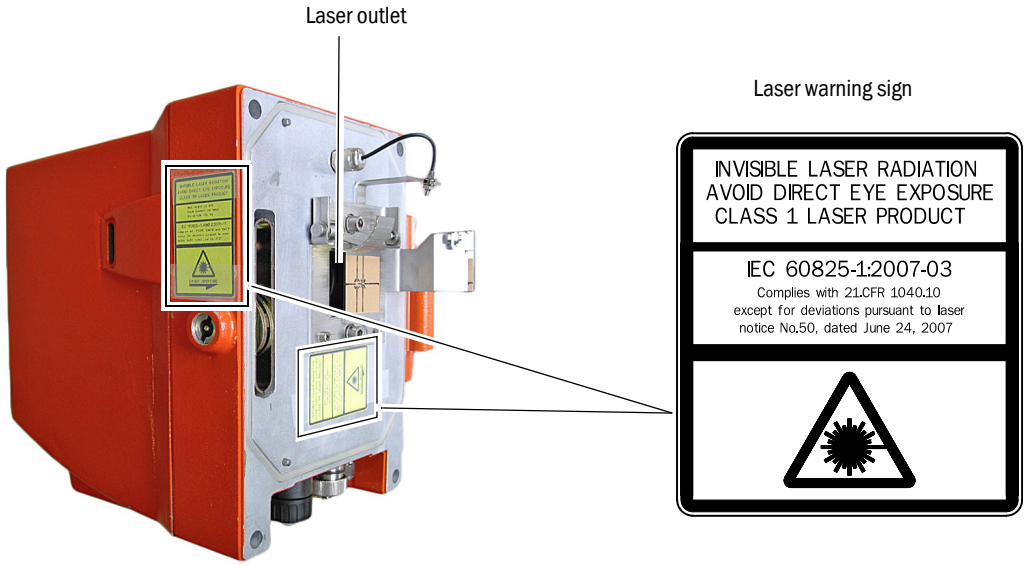
1.2.2 Protection against laser radiation

The GM700 laser warning sign is located on the sender/receiver unit.

Fig. 1 Laser warning sign on the GM700 sender/receiver unit (example O_2 measurement)



NOTICE: **Laser classes of the GM700 sender/receiver unit:**

- **Laser class 1** in normal measuring operation – the sender/receiver unit (SR-unit incl. purge gas fixture) is fitted securely on the flange with tube and locked or
- **Laser class 3R** when the SR-unit is unlocked and swiveled in position **and the power supply** is **switched on** via CAN Bus cable from the evaluation unit!

The invisible laser beam within the SR-unit is not accessible when fitted. There is no risk for the human eye when looking into the optic visor on the right side of the SR-unit. The CAN connection cable to the evaluation unit must be disconnected during disassembly or maintenance work (e.g. cleaning the front window) otherwise the laser beam could be touched or accessed.

WARNING: Eye injuries possible due to laser radiation when the SR-unit or the reflector is swiveled open!

The retina of a human eye can be damaged when a person looks directly into the laser beam for a longer time.

- **Always** switch the GM700 SR-unit off or **disconnect** the SR-unit CAN cable to the evaluation unit during installation work on the SR-unit (when connected)!
- **Never** look directly into the laser beam! **Even with** optical instruments!
- **Never** direct the laser beam at other persons!
- Make sure the laser beam is not aimed at reflecting surfaces.
- See Laser Protection Ordinance according to IEC 60825-1!

Otherwise this could result in dangerous exposure to radiation.

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Laser capacity

The laser wavelength varies for the respective measuring components. The laser output capacity is <10 mW on the optical interface (front window) of the GM700 SR-unit. The emitted radiation is harmless to human skin.

1.2.3 Behavior during purge gas failure

GM700 measuring system configurations must include immediate resp. quick measures to protect the measuring system should the purge air feed fail.

Measures for purge gas feed failure

► Refer to Purge Air Unit Operating Instructions.

1.3 Intended use

Refer to IEC 60079-29-2:2007

1.3.1 Purpose of the device

The GM700 gas analyzer measures the sample gas component concentration, e.g. HF, NH_3, HCl or O_2 in a gas mixture (sample gas). For this purpose, the GM700 analyzer is assembled at the measuring location and measures directly on-site (in-situ measurement).

WARNING: The GM700 can be used in ex-free environments only
The application on a duct that is declared as an ATEX zone 2 requires the use of an appropriate zone separation, such as the process windows shown in this manual.
The GM700 is conform to the ATEX category ATEX II 3G [Ex op is (x) T4 Gc]IIC

1.4 Responsibility of user

Intended users

The GM700 may be operated by competent persons only who, based on their device-specific training and knowledge of the device as well as knowledge of the relevant regulations, can assess the tasks given and recognize the dangers involved.

Correct use

The basis of this manual is the delivery of the GM700 according to the preceding project planning (e.g. based on the SICK application questionnaire) .
If you are not sure whether the GM700 complies with the planned state or the delivered system documentation, please contact SICK Customer Service.

► Only use the device as described in these Operating Instructions (→ p. 13, §2). The manufacturer bears no responsibility for any other use.

► Carry out the specified maintenance work.

⊗ Do not remove, add or change any components in or on the device unless such changes are officially allowed and specified by the manufacturer. Otherwise

- the device may become dangerous
- the manufacturer's warranty becomes void
- the approval for usage in potentially explosive atmospheres becomes void.Special local requirements
  Follow local laws, regulations and company-internal operating directives applicable at the installation location.

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Responsibility for dangerous substances

WARNING: Mortal/health danger as a result of a gas path leakage

When the device is used to measure toxic gases: A leak, for example in the purge gas supply, can be an acute hazard for persons.

- ► Take suitable safety measures.
- ► Make sure these safety precautions are followed.

Safety precautions examples:

- Marking the device with warning signs
- Marking the operating area with warning signs
- Safety-related instruction of personnel who could be in the vicinity of the installation site.

Keeping documents

- ► Keep these Operating Instructions available for reference.
- ► Pass on to a new owner/operator.

1.4.1 Disposing of device parts harmful to the environment

DANGER: Possible materials harmful to the environment and health

GM700 components can have small shares of pollutants or hazardous substances such as low lead content in printed circuit boards. The optional permanent cuvette contains low concentrations of HF or HCl (according to device configuration, see scope of delivery).

- ► Dispose of all GM700 components according to local laws, regulations and company-internal operating directives applicable at the installation location such as:
  - ► Printed circuit boards and similar electronic components
  - ► Dispose of the permanent cuvette, when fitted, safely because it contain low concentrations of HCl or HF. Therefore, do not simply destroy the cuvette.

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GM700

2 Product Overview

Product identification
GM700 System Process version, layout
Measuring principle

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2.1 Product identification

Product name:	GM700
Device versions	GM700 Process version Device type GM700-2, HF version, was performance-tested for measuring ranges 5 and 25 mg/m³ in accordance with EN15267-3 (TÜV Rheinland 936/21210058/A of September 30, 2010)
Manufacturer:	SICK AG Erwin-Sick-Str. 1 · 79183 Waldkirch · Germany
Type plates:	? SR-unit: On the right side

2.2 GM700 system, Process version, layout

Fig. 2 Standard layout for GM700 measuring systems (Process version)

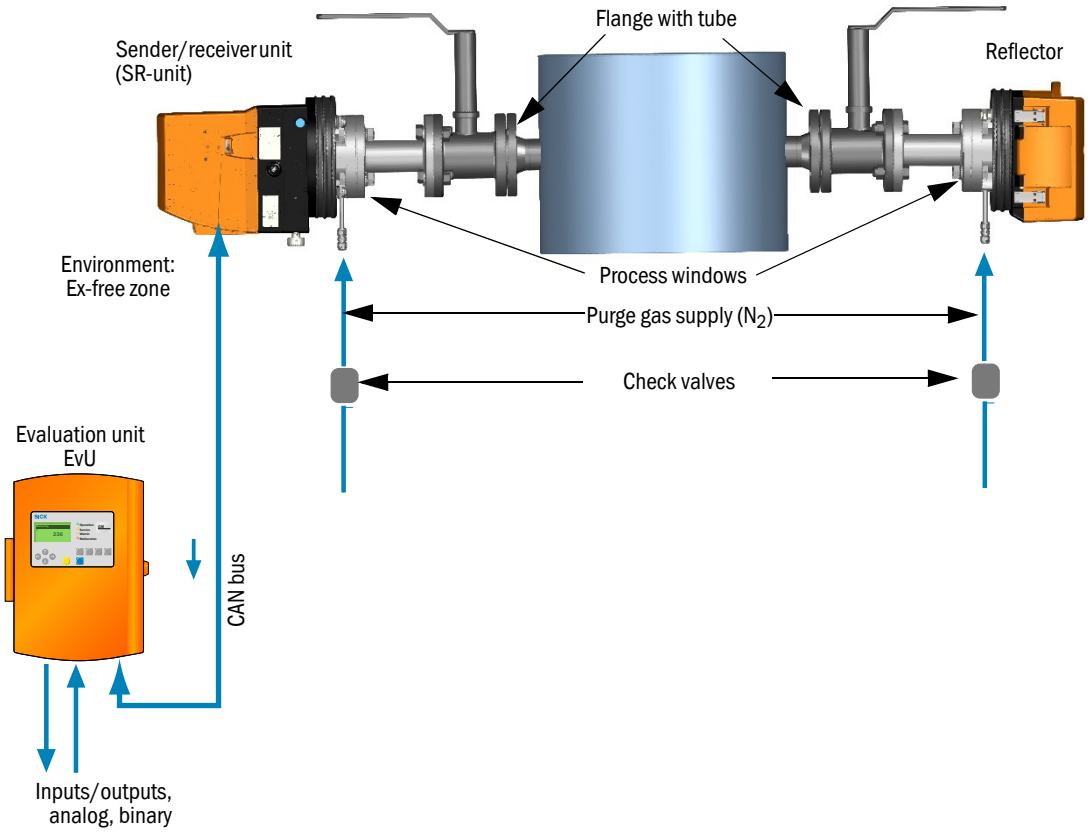

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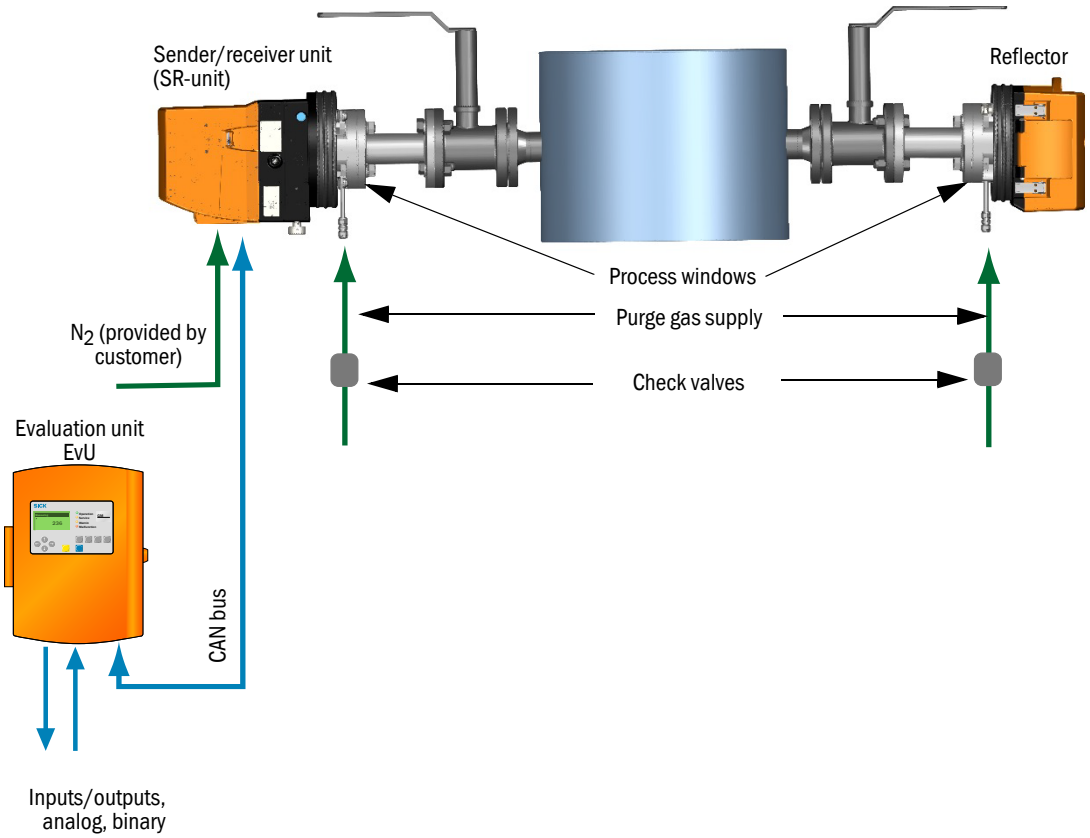
Fig. 3 GM700 measuring system (Process version) for O_2 measurement



Sender/receiver unit (SR-unit)

The sender/receiver unit contains the optic and electronic subassemblies of the measuring system. The gas concentration is captured here and the measured value determined.

Purge Gas Suppy

Depending on the application, the process windows may need the supply of an inert gas (typically N2) to keep the optical surfaces clean and prevent the measurement gas from entering the flanges, thus affecting the active measurement path length. This purge gas must be provided at a suitable pressure (typ. 4bar) and a suitable amount (this is application dependent and may be up to 15m3/h/side).

Make sure the supply is equipped with a check valve to prevent the duct gas from emerging in case of a supply failure.

CAUTION: Always switch off purge gas supply when isolation valve is closed

In case an isolation valve is installed, the purge gas supply must be switched OFF whenever the valve is closed to prevent window damage due to overpressure. (Shut off valve required!)

Make sure the purge gas supply pressure can not exceed 5 bar.

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Evaluation unit

The evaluation unit in the GM700 measuring system serves as user interface and is responsible for measured value processing and output as well as control and monitoring functions. The EvU can be located in the vicinity of the SR-unit. It can also be located up to about 1000 meters from the sampling point, e.g. installed in the switch center or monitoring center, and performs functions such as:

- Output of measured values, computed data and operating states
- Communication with the peripheral equipment
- Output of error messages and other status signals
- Control of automatic test functions and access during service (diagnosis)

Connection cables

Cable type	Part No.
• Cable (CAN bus) SR-unit – evaluation unit, length 4 m Extensions up to 1000 m (with terminal box)	2020440

2.3 GM700 options and accessories

- **Terminal box** for CAN bus with 24 V power supply

  The optional terminal box is available for distances between SR-unit and EvU larger than 4 meters via a CAN bus cable provided by the customer. The total length of all CAN bus connections in the GM700 measuring system can be up to 1000 meters.
- **Weatherproof cover** for SR-unit and process window

  Required for assembly outdoors – dimensional drawings → p. 104, §9.9
- **Chart recorder**, single or multi-channel, for measured value recording. Protocol(s) can of course be produced using customer systems.
- **Air heater** for purge air supply (air supplied system only)

  For special application conditions to prevent condensate. An air heater is required when the difference between gas temperature and dew point temperature is too small. The following practical rule of thumb serves as guideline:

2.4 Measuring principle

The light of the laser diode radiates through the sample gas and is then detected by a photo diode. The laser diode wavelength is set to a single absorption line of the sample gas component. This absorption line is scanned by modulating the wavelength and then the transmission signal (relation between signal sent and received) captured by a photo diode. An appropriate signal evaluation returns the magnitude of the absorption line from which the gas concentration is then calculated. This method is called *Tunable Diode Laser Spectroscopy (TDLS)* or *Tunable Diode Laser Absorption Spectroscopy (TDLAS)*.

A laser specially developed for gas analysis is used as light source in the GM700. This laser diode radiates a wavelength with a narrow line width so that an absorption line can be reliably scanned. A Peltier element and a temperature sensor fitted in the laser diode enclosure ensure a precise temperature and therefore exact wavelength stabilization of the system.

The laser beam from the sender/receiver unit travels through the active measuring path and then impinges on the reflector on the other side of the gas duct. The beam is then reflected back to the sender/receiver unit. After the beam has passed through the measuring path twice, during which laser light absorption specific to the gas occurs, the light is focussed on a receiver optics.

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2.4.1 Reference cuvettes for wavelength stabilization

The GM700 is equipped – depending on the device version - with:

- A permanently filled cuvette for the adjustment of the analyzer laser diode to the reference position of the gas absorption line (Line-Locking).

or

- a flow cuvette which serves to stabilize the wavelength by feeding test gas from a test gas cylinder when the measuring component concentration in the sample gas is not adequate → p. 73, § 7.6.2.

2.4.2 Signal evaluation

The optimized algorithms of the GM700 evaluation electronics process the measurement signal of the receiver element together with the corresponding parameters based on the TDLS measuring method. This is based on the physical characteristics of the gas molecules that absorb light energy in certain wavelengths. These optimized algorithms ensure the concentrations of sample gas components are determined without cross-sensitivities to other gases. The differential absorption measurement also eliminate dust influences.

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GM700

3 Project Planning Information

Project Planning Checklist
Initial on-site installation
Preparations for electrical installation

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3.1 Work steps from system selection to start-up

Application changes

If you make changes to the specifications ordered for your application or if a device is to be used for an application different to the one originally planned, please pass this information onto your local sales representative so that we can determine the application options under changed conditions and whether new adjustment/parameter settings are required.

The following steps are normally taken before starting-up the measuring system

- **Project planning**
  → »Project Planning Checklist« (p. 21)
- **Initial on-site installation**
  - ► Following preparatory work normally carried out by the customer is described on p. 22, §3.3:
  - ► Flange assembly → p. 23, §3.3.3
  - ► Preparation for process windows → p. 27, §3.3.5
  - ► Laying signal and power supply cables to the sampling point, → p. 27, §3.3.5
- **Assembly preparation** for the EvU, → p. 27, §3.3.6
  - ► Possibly preparation of signal cables for the interface to peripheral equipment, → p. 27, §3.4
- **Device installation**
  To allow speedy start-up, the following components are normally installed ready for operation before the start-up date; see also p. 31, §4.
  - – Purge gas supply must be available
  - – Evaluation unit(s)
- **Start-up**
  The actual start-up is carried out by trained personnel or Customer Service. This work is described on §6 (→ p. 47). -The main activities are adjustment tasks on the GM700 system related to the application.

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3.2 Project Planning Checklist

Project planning, step by step

The following Checklist simplifies performing and controlling project planning measures required before start-up in the correct sequence. Technical data and dimensional drawings of system components, see p. 93, §9 and following.

Topic	Task	Measure/determination
Determine sampling point Observe national regulations such as VDI 3950	Provide for unhindered inlet and outlet paths: ► For round duct cross-sections: 3 times the duct diameter ► For rectangular cross-sections: ► Hydraulic diameter $D = \frac{4F\ (Cross\text{-}sectional\ area)}{U\ (Circumference)}$ ► If these specifications cannot be met: Inlet section > outlet section, e.g. $^2/_3$: $^1/_3$; uniform concentration spread whenever possible	
	Emission sampling point	► Obtain official approval for emission sampling point. ► Provide for calibration openings at an easily accessible place. ► Ensure the GM700 and calibration probes do not influence each other; plan the calibration connection at least 0.5 m upstream from the measuring device
	Application conditions	► Observe Technical Data for duct/ambient conditions! ► Gas temperature above/below dew point (dry/wet)
	Pressure conditions at the sampling point	► A fitting location with partial vacuum in the duct is ideal. ► For duct pressures > 10 mbar, contact SICK on correct selection of the purge gas supply.
SR-unit, reflector → p. 22, §3.3.1	Select suitable flange with tube	► The flange is designed to be installed in steel ducts; suitable flanges with tube are usually supplied with GM700. ► Stone stacks or ducts with thick walls demand an on-site retaining plate and, possibly, a longer version of the flange with tube; → p. 27, §3.3.5 • → p. 93, §9
	Duct openings selection	► Provide an opening of suitable size for the flange tube. ► Plan adequate clearance for installation and maintenance activities for the duct insulation cutout. ► Plan clearances for handling the SR-unit, reflector ► Ensure the ambient temperature for the SR-unit resp. reflector is within the specified range. ► For assembly outside, plan a weatherproof cover
	Tools for start-up and maintenance	► When working on the zero path; prerequisites: Clean ambient atmosphere free from sample gas; weatherproof: Plan the zero path or order from SICK.
Evaluation unit → p. 27, §3.3.6	Determine the fitting location	► Plan assembling the unit at an easily accessible location ► Ambient temperature within the specifications, → p. 94, §9.2.

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Topic	Task	Measure/determination
Assembly platform	Specify the assembly platform	► Provide a suitable working platform for installation on the outside of a duct/stack. ► The fitting location of the GM700 SR-unit should be about 1.3 to 1.5 m above the platform. ► The platform must be large enough, secured and positioned so that all device parts can be accessed without danger. This is especially important when inserting and removing the SR-unit or reflector.
Accident prevention	► Applicable (national) regulations on accident prevention must be observed.	

3.3 Initial on-site installation

The work described in the following can be carried out by the customer's installers. Prerequisite is that all the required specifications have been made based on the Project Planning Checklist.

3.3.1 Assembly preparation at the sampling point

This Section describes the welding work on the duct including making fixing elements on-site.

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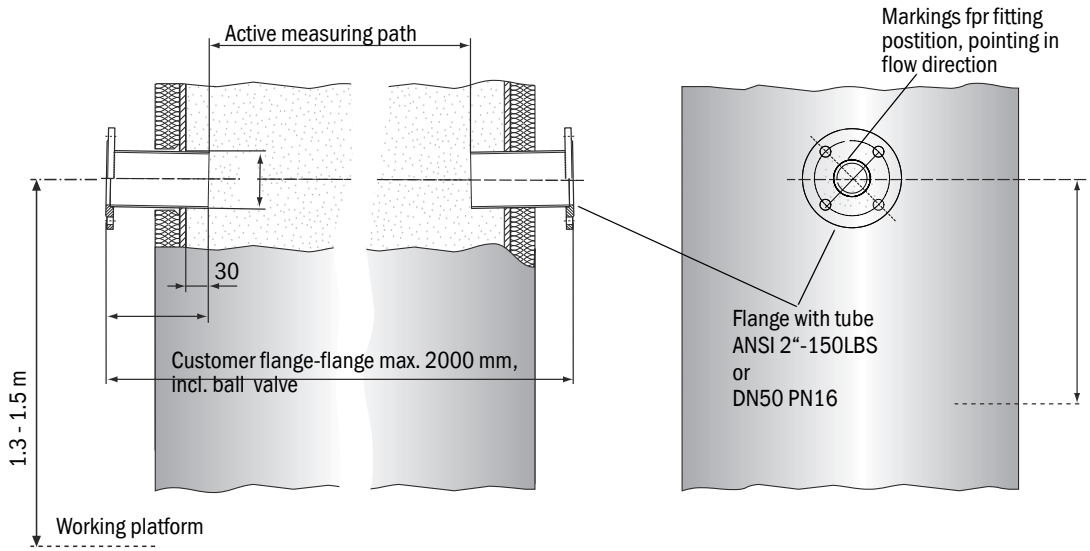
Fig. 4 Fitting recommendation for the mounting flange (duct diameter not representative)


Active measuring path
Markings fpr fitting postition, pointing in flow direction
30
Customer flange-flange max. 2000 mm, incl. ball valve
Flange with tube ANSI 2“-150LBS or DN50 PN16
1.3 - 1.5 m
Working platform

CAUTION: Protective measures at the sampling point

- ► Always shut down the installation before any work on the duct!
- ► Secure parts to be separated, e.g. with wire binding, to prevent damage caused by falling parts.
- ► Take appropriate protective measures against hot, explosive gases or toxic gases that could possibly escape from the duct.
- ► Take all the necessary safety measures during welding work, among others against the risk of explosion or fire in the duct atmosphere and on the duct insulation.
- ► If necessary, seal off the mounting flange with a cover securely until device assembly (e,g, for overpressure in duct).
- ► Note:.

CAUTION: Ex-free condition for installation works of process windows

Installation of the process windows on a duct requires "ex-free" conditions and appropriate clearance

3.3.2 Uncovering the duct

- ► Remove any duct insulation to uncover an area of approx. 800 x 1500 mm (W x H) to prepare the duct for the following work.
- ► Keep the insulation material removed for later refitting resp. provide new suitable insulation material.

3.3.3 Mounting the flange with tube

SICK delivers two flanges with tube as standard: A DN50PN16 or ANSi 2 - 150LB.

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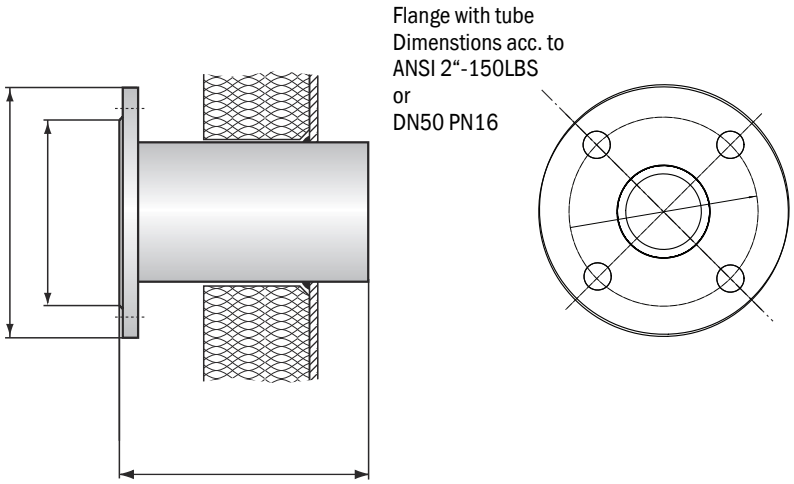
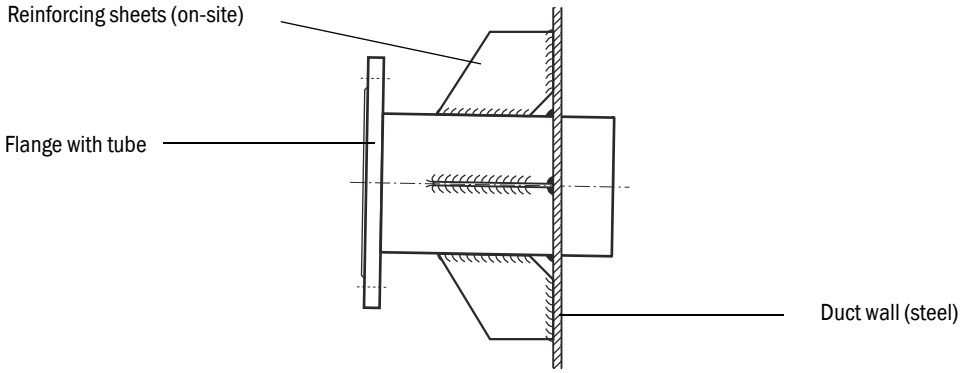
Fig. 5 Flange with tube for Process windows



Reinforcement with junction plates recommended

Due to the weight of the sender/receiver unit, we recommend reinforcing the flange tube fixture on-site with junction plates.

Fig. 6 Reinforcing with junction plates



Gas-carrying duct made of stone/concrete

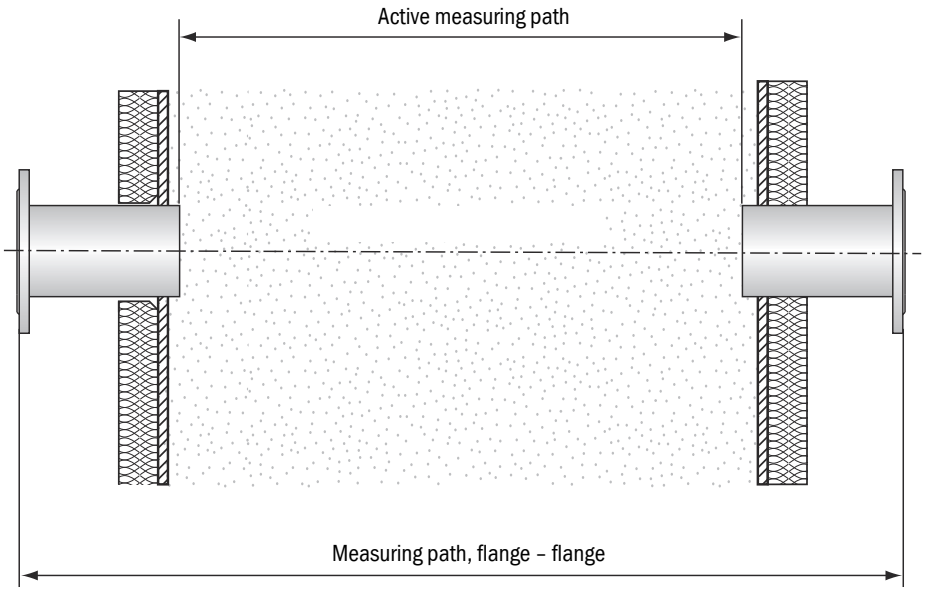
An additional retaining plate with suitable opening can be manufactured for ducts not made of steel and in which the flange with tube can be welded.

Subject to change without notice

3.3.3.1 Assembling the flanges with tube

CAUTION: Always observe safety information on → p. 8, § 1.1!

Fig. 7 Flange assembly - determining the measuring path



During assembly of the “flanges with tube”, the specifications in the test protocol for the “flange - flange” and “active measuring path” dimensions must be maintained. Deviations up to ±2% can be compensated by the local SICK Customer Service. Larger deviations of the “flange - flange” dimension require optical readjustment by the manufacturer, larger deviations of the active measuring path require recalibration by the manufacturer.

1 flange centerpoints (on SR and reflector side)

Optical alignment
The SR side tube axis should be as flush as possible with the reflector side tube axis (< ± 1°)

1 Mark exactly the flange centerpoints on the duct wall (on SR and reflector side)

Optical alignment
The SR side tube axis should be as flush as possible with the reflector side tube axis (< ± 1°)

Opical alignment in non-hazardous zone only!
The alignment tool is battery operated. Use in non-hazard zones only!

– On ducts made of stone/concrete: Cut the duct opening out approx. 2 cm larger than the outer flange tube diameter; at the same time, plan a light downward incline of the flange tube by approx. 1°. Provide a suitable retainer plate.

2 Cut an opening matching the outer flange tube diameter (standard $Ø_a$ = 133 mm) out of the duct wall resp. retainer plate.

3 Position the flange tube so that the marking ▲ points exactly in gas flow direction

4 Affix in the fitting position.

Subject to change without notice

– Whenever possible, weld on junction plates as reinforcement; cf. → p. 24, Fig. 6. For ducts made of stone/concrete: Anchor the retainer plate with flange with tube welded on securely to the duct.

5 Weld the flange tube on.

6 Optical flange alignment.

a) Remove the protective cap from the adjustment tube.

b) Fit the alignment tool (light source on SR-unit side, adjustment tube on reflector side) onto the flange (→ Fig. 8).

c) Look at the window of the adjustment tube and focus the light spot of the light source by shifting the optical beam tube.

d) Align the flange which contains the adjustment tube: The light spot must be shown centrally in the target of the adjustment tube (→ Fig. 9).

Fig. 8 Flange alignment using an adjustment tool

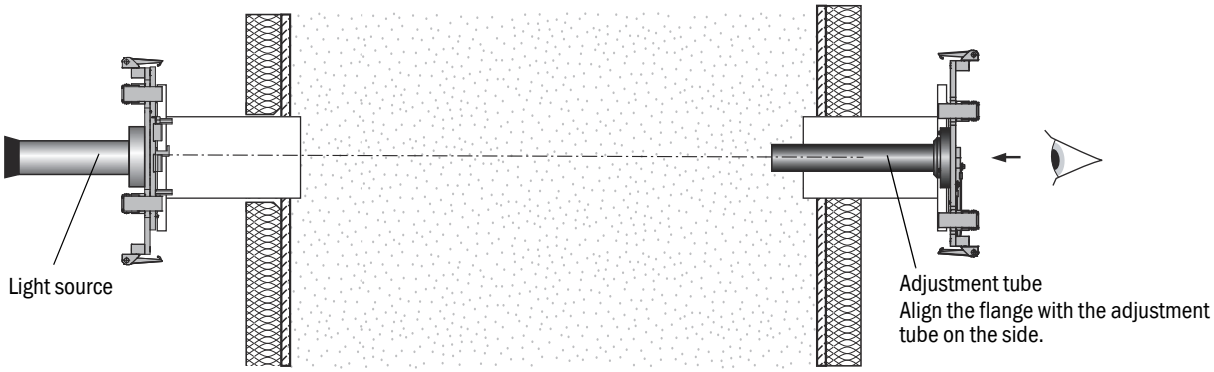
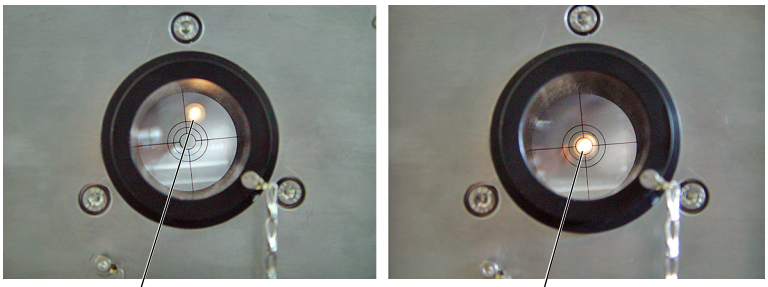


Fig. 9 Optical alignment - at the window of the adjustment tube



e) Interchange the adjustment tool with light source and the adjustment tube. Realign the flange with the adjustment tube: The light spot must be shown centrally in the target of the adjustment tube.

7 Now fix the “flange with tube” properly to the gas duct.

Make sure the flange alignment does not change.

8 Check the “active measuring path” dimension, the “flange - flange” dimension and the alignment.

9 Remove the adjustment tool.

10 If necessary, attach duct insulation (protect GM700 from heat).

NOTICE: Observe the GM700 ambient temperature

► When the gas duct is hot, insulate the duct and flanges so that the (GM700→ p. 64, §) is protected against high temperatures.

Subject to change without notice

3.3.4 Purge gas supply

Inert purge gas (N_2) must be available to connect to the inlets at the process windows. A check valve is recommended.

***NOTICE:* Adequate purge gas pressure**

- During project planning, make sure the purge gas pressure is sufficient to force the purge gas into the gas duct. Please contact SICK Customer Service or your local representative when necessary.

3.3.5 Duct insulation

- Refit the thermal duct insulation; reinforce the insulation when necessary.

WARNING: Observe the ambient temperature!

The SR-unit of GM700 is designed for a maximum ambient temperature of +50 °C. Radiant heat on the enclosure surface can, among others, create temperatures higher than the measured air temperature. Therefore, design insulation and radiation shielding so that temperature limits are reliably maintained.

3.3.6 Assembly preparation for the evaluation unit

The installation location for the evaluation unit was defined within the project planning framework (→ p. 21, §3.2). The 1000 meter maximum total cable length of all CAN bus connections in the GM700 measuring system must be considered, whereby installation close to the sampling point is recommended to facilitate system operation.

Installation location preparation

The evaluation unit has fastening openings in the enclosure for easy fixing.

- Based on the EvU dimensional drawing according to → p. 35, Fig. 13 resp. → p. 35, Fig. 14. ensure enough space is available at the planned installation location to attach these, for wiring as well as opening the enclosure door.
- Drill suitable openings as assembly points as required.

3.4 Preparations for electrical installation

The on-site supply and signal cables are laid beforehand to facilitate subsequent installation and start-up of the GM700 system components. Suitable cable ducts resp. empty conduits are installed for cables already prefabricated and delivered with the GM700 system. Suitably qualified personnel or Customer Service connect the prepared cables to the device during installation resp. start-up.

3.4.1 Signal and power supply cables

WARNING: Observe safety information!

Always observe safety information and relevant safety regulations. During all work on electrical equipment, disconnect such equipment from the mains, check that the equipment is potential free and make sure that no third person can switch the equipment back on again without authorization. Leave the power supply switched off during the following device installation.

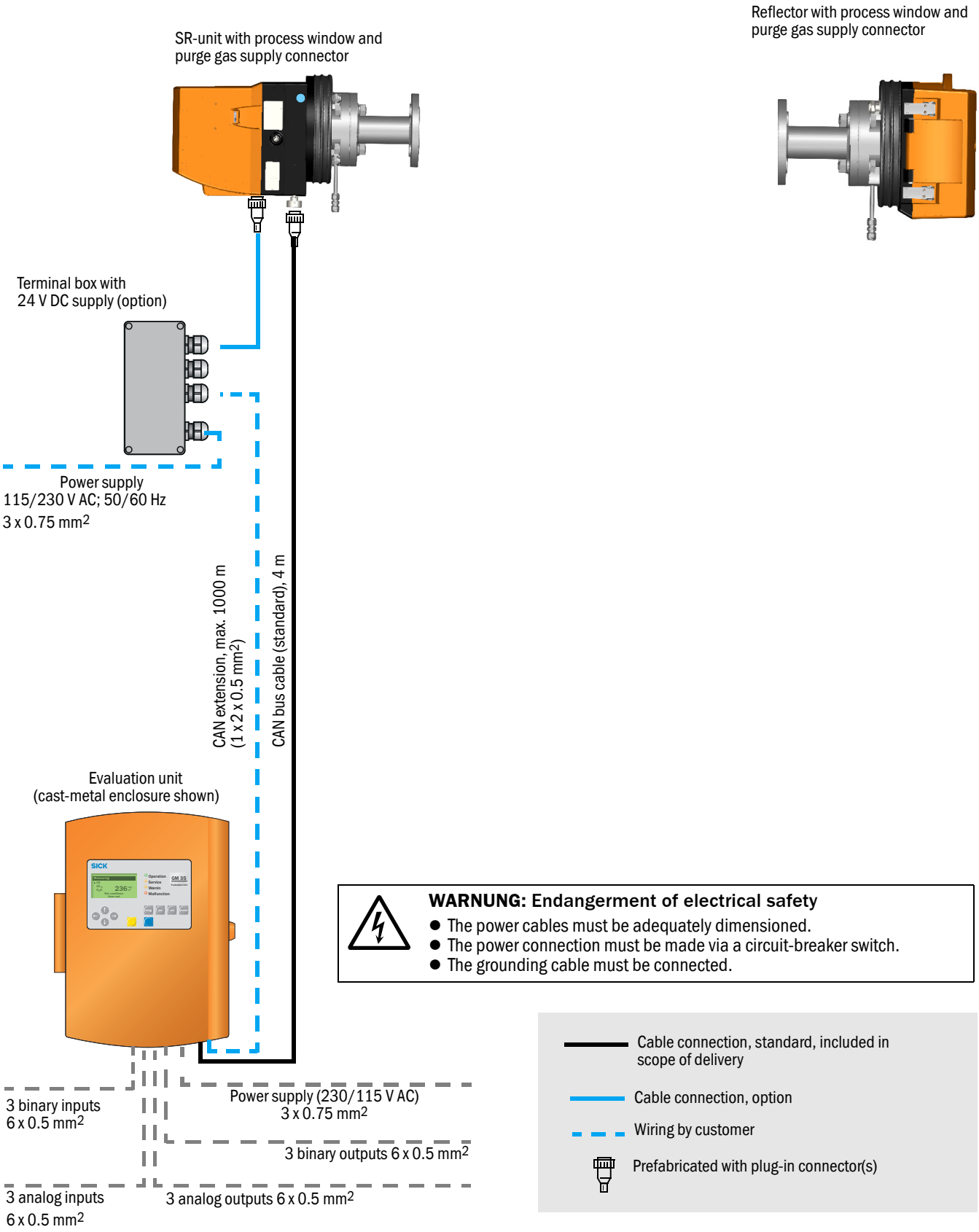
- The power connection must be made via a circuit-breaker switch.
- The grounding cable must be connected.

CAUTION: Equipment damage through erroneous or missing grounding

Ensure that the protective grounding exists.

Subject to change without notice

Fig. 10 Circuit diagram (Process window)


SR-unit with process window and purge gas supply connector
Reflector with process window and purge gas supply connector
Terminal box with 24 V DC supply (option)
Power supply 115/230 V AC; 50/60 Hz 3 x 0.75 mm2
CAN extension, max. 1000 m (1 x 2 x 0.5 mm2)
CAN bus cable (standard), 4 m
Evaluation unit (cast-metal enclosure shown)
WARNUNG: Endangerment of electrical safety
The power cables must be adequately dimensioned.
The power connection must be made via a circuit-breaker switch.
The grounding cable must be connected.
3 binary inputs 6 x 0.5 mm2
Power supply (230/115 V AC) 3 x 0.75 mm2
3 binary outputs 6 x 0.5 mm2
3 analog inputs 6 x 0.5 mm2
3 analog outputs 6 x 0.5 mm2
Cable connection, standard, included in scope of delivery
Cable connection, option
Wiring by customer
Prefabricated with plug-in connector(s)

Subject to change without notice

WARNING: Endangerment of electrical safety
- ► The power cables must be adequately dimensioned.
- ► Make sure the circuit breaker is accessible.

CAUTION: Equipment damage through erroneous or missing grounding
Ensure that protective grounding exists.
The power cables must be adequately dimensioned.

CAN bus wiring

Standard cables

An installation location in the vicinity of the sampling point is generally selected for the EvU so that the 4 m CAN bus cable in the scope of delivery is sufficient for cabling without additional installation effort.

Assembly away from the evaluation unit

A terminal box with a 24 V power supply unit can be delivered when the EvU is to be located at a greater distance from the SR-unit. This is then connected to the SR-unit using the 4 m CAN bus cable delivered with the measuring system. A customer cable suitable for CAN bus applications, 6-pole cable (twisted pair wires and shielded), then leads to the EvU. The total length of the CAN bus connections, may be up to 1000 meters. When performing maintenance or service, it must be possible to deinstall the EvU temporarily and connect it directly to the SR-unit at the sampling point.

Laying the cables

- ► Provide adequate cable lengths at the connection points.
- ► Whenever possible, do not lay power supply cables immediately next to signal cables.
- ► Protect open ends of preinstalled cables against weather effects until device installation.
- ► Install separate power supply cables and circuit breakers for:
  - – Purge gas units; additional motor circuit breakers and optional protective phase failure switches.
  - – Evaluation unit

WARNING: Take precautions to prevent accidental switching off of the purge gas supply.
- ► Attach a clearly visible warning against accidental switching off the separation equipment for the purge air unit.

- ► Install easily accessible cable ducts or empty conduits for the prefabricated cables to those delivered with the system (→ p. 36, Fig. 15) marked with one or two plug-in connectors Approx. 2 m cable lengths each should be available at the sampling point for later maintenance work on the measuring system when dismounted from the duct.
- ► Lay on-site cables (shown without plugs) according to → p. 36, Fig. 15.
  - – Wire cross-section specifications are recommendations from which cables for analog and binary signals can slightly deviate (not however for the CAN bus connections resp. power supply cables).
  - – Start with the system internal connections of the GM700.

Status and signal cables from the EvU to the connection terminals of the customer's status/message devices can be added later as required.

Subject to change without notice

Subject to change without notice

GM700

4 Installation

Preparations
Fitting system components
Installing the evaluation unit
Electrical connection of system components

Subject to change without notice

4.1 Preparations

This Section describes the assembly and installation work for the GM700 measuring system before the actual start-up. Completion of the on-site preinstallation according to p. 19, §3 is assumed.

4.1.1 Checking the scope of delivery

- ► Check the delivery against the belonging delivery note and make sure the complete measuring system has been delivered as ordered.
- ► Check that the specifications on mains voltage and frequency on the type plates of the GM700 components match the installation conditions, delivery note and the order.

4.1.2 Installation prerequisites

The following prerequisites are applicable for the work described in the following:

- ► Plan safe usage/application within the limits defined on p. 93, §9.
- ► Compliance with the specifications made during project planning (according to p. 21, §3.2) and correct performance of on-site preinstallation according to p. 22, §3.3.

WARNING: Power supply OFF!
During the following work, it must be ensured that the power supply to the devices and cables involved is switched off and can only be activated by the personnel carrying out the work when the work is completed resp. for test purposes and then under consideration of valid safety regulations.

Subject to change without notice

4.2 Fitting system components

4.2.1 Information on fitting the sender/receiver unit or reflector

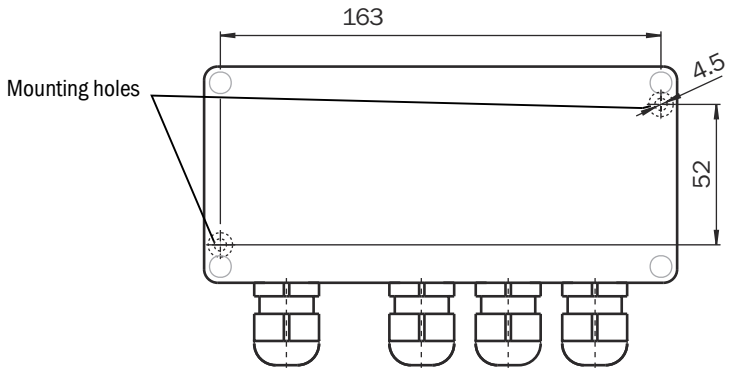
The sender/receiver unit (SR-unit) and reflector are first fitted on the duct during start-up because these components first require a zero adjust away from the gas-carrying duct. To avoid problems during start-up, the SR-unit and reflector must be stored in a dry place free from dust, preferably at room temperature, until start-up

CAUTION: Do not fit the sender/receiver unit or reflector before start-up!
Unfavorable ambient conditions or atmosphere in the measuring channel can damage the measuring system which prevents start-up. Apart from that, there is a health risk when opening the duct depending on the pressure, gas temperature and composition in the sample gas duct.

4.2.2 Terminal box with 24 V power supply unit (option)

- Install the terminal box with 24 V power supply unit in the vicinity of the sampling point.
- Secure the enclosure using both mounting holes (∅ 5 mm)
- The cable length available from the terminal box to the SR-unit is 4 m.Take the empty conduits laid for the prefabricated cables during on-site preinstallation into account.

Fig. 11 Fitting the terminal box with power supply unit



Subject to change without notice

4.3 Installing the evaluation unit

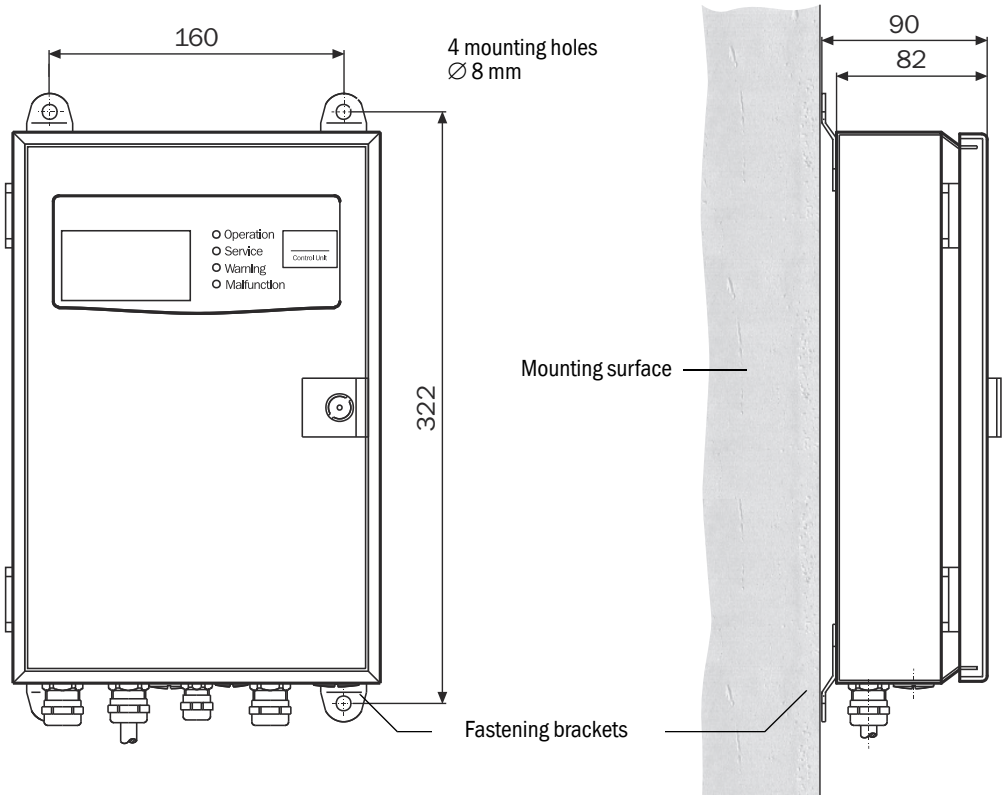
The fitting location for the evaluation unit was defined during project planning (→ p. 21, §3.2) and prepared during on-site preinstallation as required.

- ► Make sure the CAN bus connection to the SR-unit selected during project planning is usable at the planned installation location. The CAN bus connection cable delivered as standard is 4 m long and serves to connect the evaluation unit directly at the sampling point.
- ► Ensure easy access without problems. In particular, make sure the swivel door of the evaluation unit can be opened without hindrance after fitting.

4.3.1 Installing the evaluation unit – sheet metal enclosure version

- ► Drill mounting holes ∅7.2 mm (for M8) at the fitting location according to the Drilling plan.
- ► Attach the evaluation unit at the installation location using the 4 planned fastening brackets with suitable screws.

Fig. 12 Installing the evaluation unit (sheet metal enclosure version)

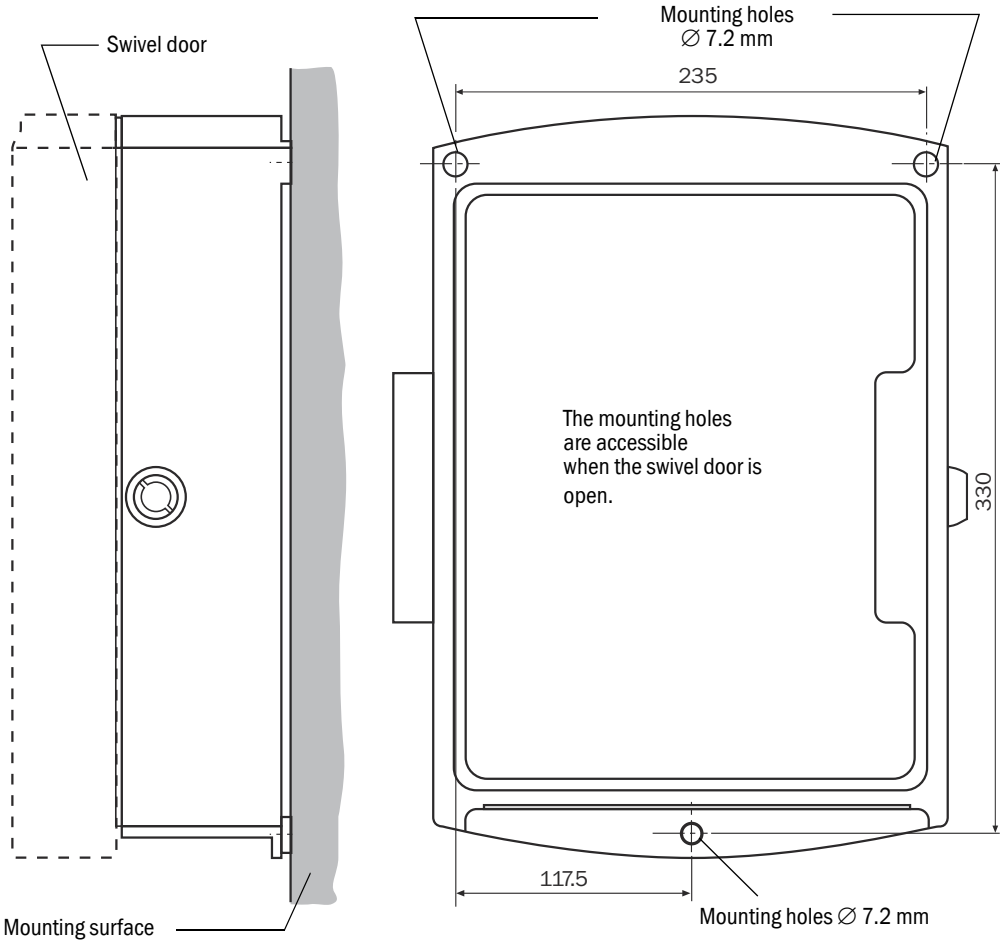


Subject to change without notice

4.3.2 Installing the evaluation unit – cast-metal enclosure version

► Drill mounting holes ∅7.2 mm (for M8) at the fitting location according to the Drilling plan.

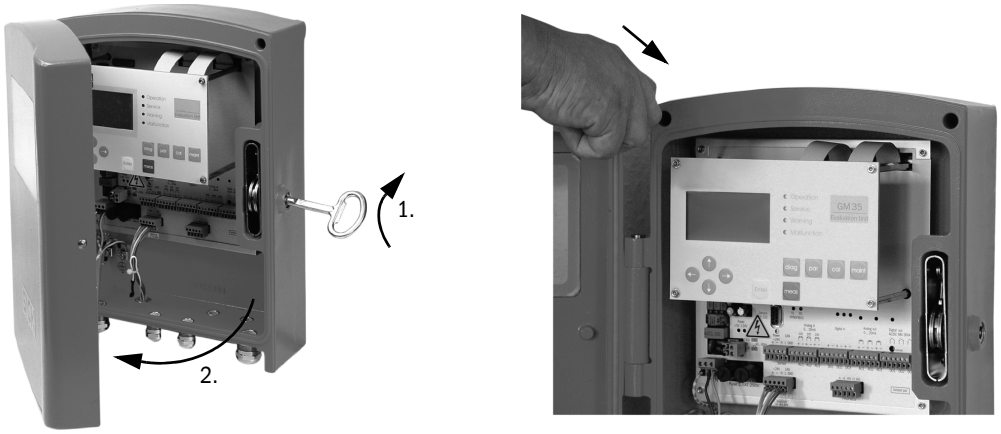
Fig. 13 Mounting holes layout (Drilling plan) to fit the EvU (cast-metal enclosure)



► Open the enclosure cover with a control cabinet key and swivel open.

► Attach the evaluation unit at the installation location using the 3 planned mounting holes with suitable screws (M8 x 20).

Fig. 14 Fitting the evaluation unit (cast-metal enclosure)



► Close and lock the cover again.

Subject to change without notice

4.4 Electrical connection of system components

On-site preparation for electrical installation has been described in p. 27, §3.4. The cables laid as described there are now connected to the system components.

CAUTION: Observe safety information as well as relevant safety regulations!
During all work on electrical equipment, disconnect such equipment from the mains, check that the equipment is potential free and make sure that no third person can switch the equipment back on again without authorization.

Electrical connections for purge air unit
→ Purge air unit Operating Instructions.

4.4.1 CAN bus wiring options

As already described in the project planning on p. 27, §3.4, the following options are available for wiring the CAN bus connection between SR-unit and evaluation unit:

- Standard cable, 4 m, prefabricated
- Terminal box with prefabricated 4 m long cable to SR-unit; a cable provided by the customer is used to connect to the evaluation unit.

Information on selecting a suitable type of wiring can be found under p. 16, §2.3.

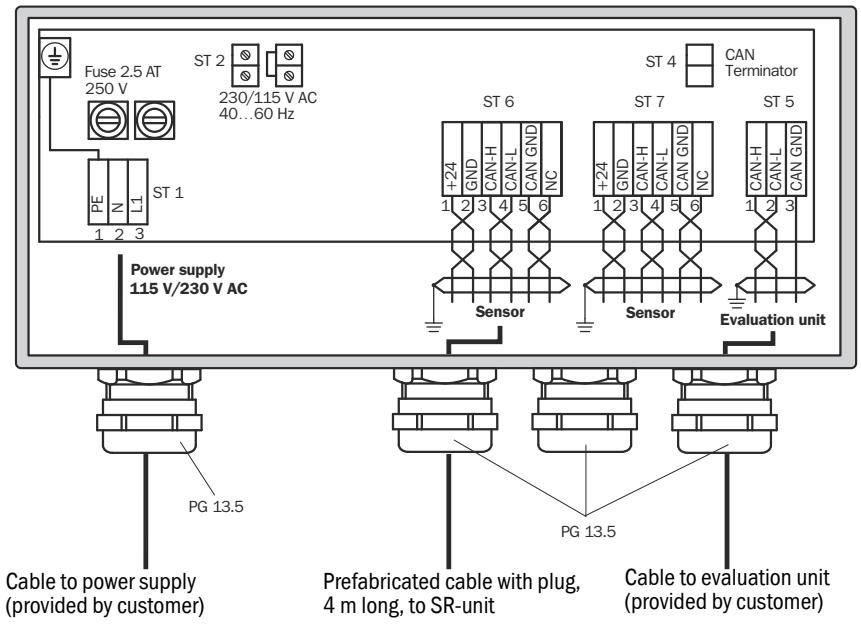
Wiring in terminal box

Connections in the terminal box are wired as follows:

Fig. 15 Terminal box for CAN bus connection between SR-unit and evaluation unit

CAN cable signals

Color	Signal
Pink	+24 V
Grey	GND
Yellow	CAN-H
Green	CAN-L
Brown	CAN-GND
White	n.c.



- ► Connect bridge (jumper) according to suitable voltage supply (ST2).
- ► Lead CAN cable (provided by customer) through the right PG screw fitting to terminal strip.
- ► Connect shielding on the PG screw fittings on the enclosure.

Subject to change without notice

CAUTION: Equipment damage through erroneous or missing grounding
Ensure that protective grounding exists.

WARNING: Endangerment of electrical safety
- ► The power cables must be adequately dimensioned.
- ► Make sure the circuit breaker is accessible.

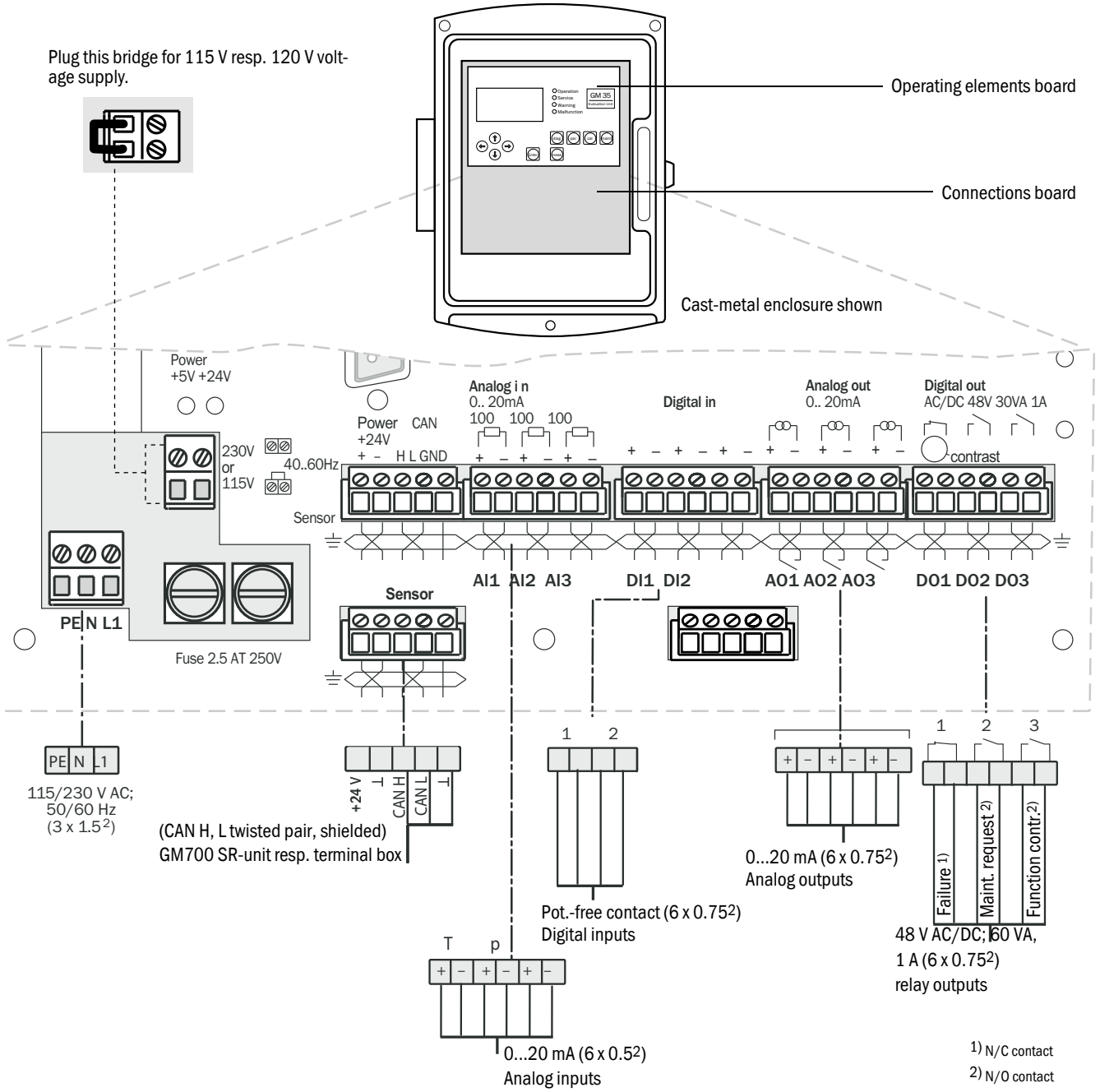
► Connect wires to terminal strip ST5 as shown in Fig. 15; check that a twisted pair cable is used for CAN-H and CAN-L. Connect the respective signals in the EvU and terminal box.

Subject to change without notice

4.4.2 Electrical connection in the evaluation unit EvU

Cable laying to the evaluation unit and relevant specifications have already been shown in → p. 36, Fig. 15.

Fig. 16 Evaluation unit connections



► Open enclosure door of evaluation unit.

WARNING: Observe connection values for power supply!

The evaluation unit is configured to 230 V AC on delivery.

► Plug the respective bridges for 115 resp. 120 V AC as shown on the connection plate of the evaluation unit.

► Make sure the power lines are correctly dimensioned.

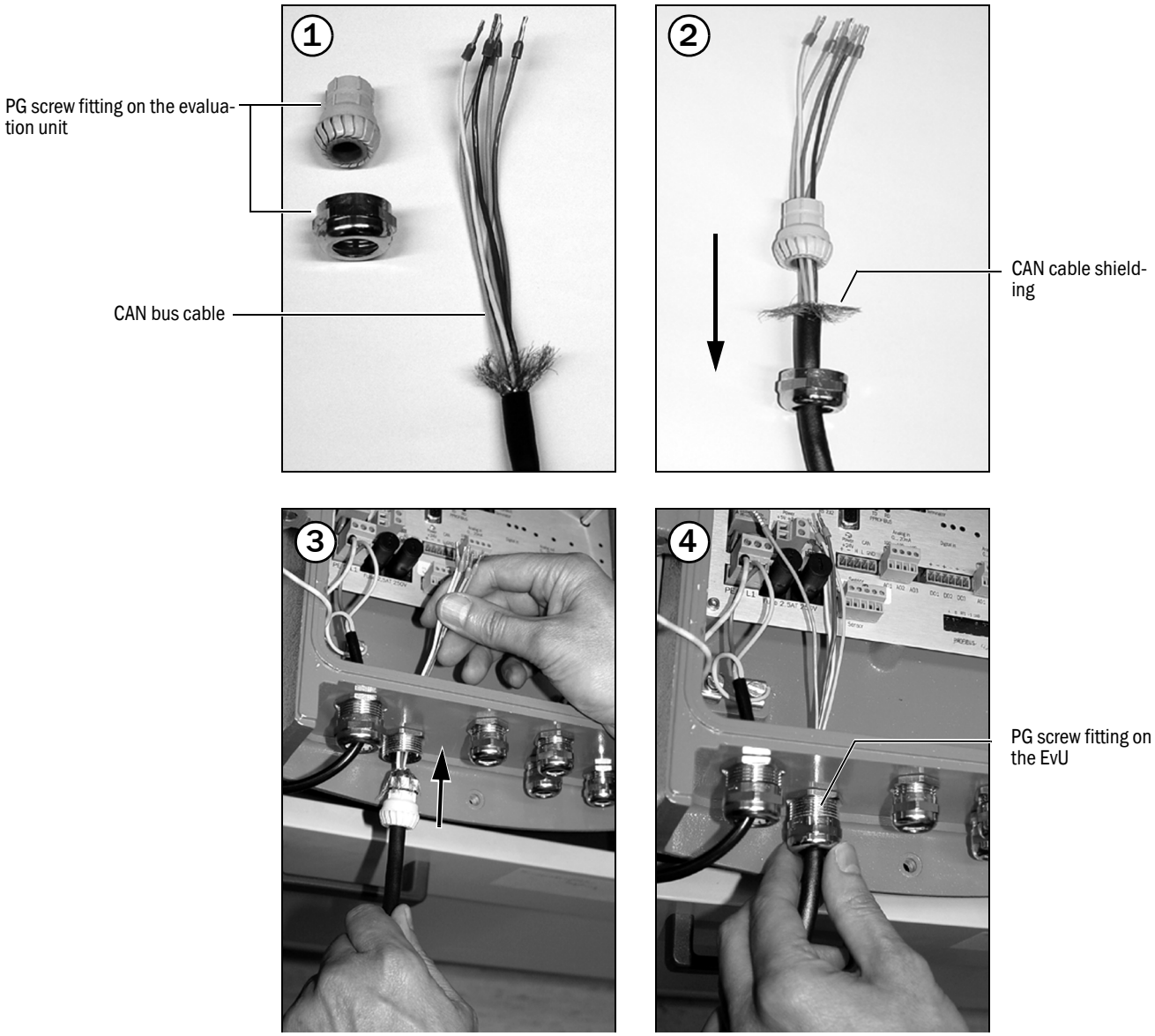
Subject to change without notice

- ► Ensure the power supply has been installed (see evaluation unit connections) according to the specifications (observe national requirements), but with the power switched off.
- ► Connect protective conductor (PE) to the terminal on the enclosure floor
- ► Lead the signal cable for inputs and outputs through the PG screw fittings on the EvU enclosure floor and wire according to p. 38, §4.4.2.
- ► When using the CAN cable provided by the customer, connect the wires to the “Sensor” terminal strip. Do not connect +24 V and GND (earth).

CAUTION: Equipment damage through erroneous or missing grounding
Ensure that protective grounding exists.

WARNING: Endangerment of electrical safety
- ► The power cables must be adequately dimensioned.
- ► Make sure the circuit breaker is accessible.

Fig. 17 See steps 1 to 4 below Connecting the CAN bus cable to the evaluation unit



Subject to change without notice

WARNING: Burns by touching the cable glands. The temperature on the cable glands could be >60 °C.

Subject to change without notice

GM700

5 Handling the Evaluation Unit

User qualifications
Operating elements
Menu overview

Subject to change without notice

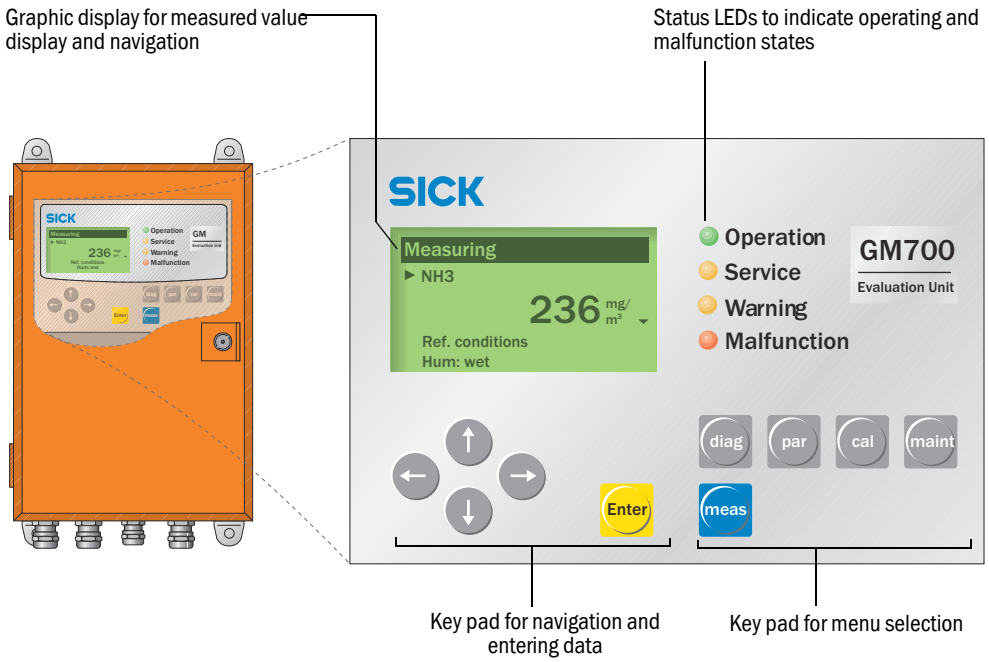
5.1 User qualifications

This Section describes how to operate the GM700 measuring system with the evaluation unit (EvU). The evaluation unit is available with either a sheet metal enclosure (protection class IP 65) or a cast-metal enclosure (protection class IP 67). The work described in this Section can be carried out by qualified customer operating personnel. Setting parameters does however demand comprehensive knowledge of the measuring system, measuring technology and specific measuring task.

5.2 Operating elements

The evaluation unit of the analysis system serves to display, enter and set parameters and control functions on the system. The operator panel with the display, status indicators and key pad is accessible when the enclosure door is opened.

Fig. 18 Evaluation unit display and operating elements (shown with sheet metal enclosure)



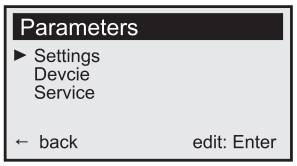
Arrow keys	Navigate, select, scroll or edit menu items, variables, units or digits.
Enter	Execute the selected menu contents or commands.
Display in measuring mode	Displays all current measured values (temperature values resp, gas concentration); Displays computed values

LEDs

• Operation	Measuring mode
• Service	Service mode
• Warning	Warning messages, see Diagnostic mode (diag)
• Malfunction	Device malfunction, error message, see Diagnostic mode (diag)

Subject to change without notice

Display contents



- The header line shows the selected operating mode (e,g, parameter settings) or the menu items just selected during navigation.
- 4 lines to show submenus, plain-text messages or settings (values)
- Function line:

  ← **back** Use button **Arrow** ← to return to next higher level

  edit Enter Use button **Enter** to activate menu item or confirm input

  select ↑ (↓) Use button **Enter** to select a variable

  When selecting a variable requiring numeric input, use buttons **Arrow** ↑ (↓) to set the numeric value per digit

  Password When a password is prompted, enter the code **1 2 3 4** using ↑ (↓).

5.2.1 Menu overview

Mode	Menu				
Measuring	**Measuring operation**				• Current measured values depending on device version • Reference variables (wet, dry)
Diagnosis	**Malfunction**				• Current error messages (plain-text)
	Warning				• Current warning messages (plain-text)
	Sensor values				• Displays diagnostic values and control values
		GM700	**Sens. values GM700**		• Current monitored sensor values (amplification setting, internal temperature control, control values, etc.)
		Sample	**Cross-Duct: OH Cross-Duct Refl.**		
Parameters	**Setting**				• Parameter settings/display of system components
		Physical Unit	**Component**	**Unit:**	• mg/m³, ppm
				Ref. condition:	• t: actual, 25 °C, 20 °C, 0 °C • p: actual, 1013 mbar • Hum.: wet, dry
			Average	**Avg. Time:**	• 0 ... 300 s
			Meas. Distance	**Active:**	• 200 ... 8000 mm
			Gas Temperature	**Source:**	• Probe, Subst. Analog In
				Subst.	• –100 ... 2000 °C
			Pressure	**Source:**	• Probe, Subst. Analog In
				Subst.	• 600 ...15000 hPa
			Humidity	**Subst.**	• 0 ... 93.0 percent by volume

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			Analog Out	**Live Zero**	• 0, 4 mA
				Output 1	• Component: e.g. HF, - -, p, T
					• Range low: 0 ... 999999
					• Range high: 0 ... 999999
					• Cycle Out: No, Yes
				Output 2	• Component: e.g. HF, - -, p, T
					• Range low: 0 ... 999999
					• Range high: 0 ... 999999
					• Cycle Out: No, Yes
				Output 3	• Component: e.g. HF, - -, p, T
					• Range low: 0 ... 999999
					• Range high: 0 ... 999999
					• Cycle Out: No, Yes
			Analog In	**Input 1 T**	• Unit: °C, K, °F
					• Live Zero: 0, 2, 4 mA
					• Range low: 0 ... 15000
					• Range high: 0 ... 15000
				Input 2 p	• Unit: hPa
					• Live Zero: 0, 2, 4 mA
					• Range low: 0 ... 15000
					• Range high: 0 ... 15000
			Coefficients Funct.	**Span (HF)**	• 0.50 ... 1.99
				Zero (HF)	• ±999
			Ambient Temp.	**Range**	• 0 ... 50 °C, –10 ... 40 °C, –20 ... 30 °C, –30 ... 20 °C, –40 ... 10 °C
			t (Feed Test Gas)	**Period**	• 0 ... 3666 d (day) Only when permanent cuvette fitted.
			Check cycle	**Period**	• 0 ... 24 h
			Zero Adjust	**Enable**	• Yes, No
				Repet.	• 0 ... 24 h (only GPP)
				t (purge)	• 0 ... 900 s; purge time until zero is executed
				t (delay)	• 0 ... 1800 s; delay until gas enters again
				Delta T	• 0 ... 999 °C; temperature difference at which a zero adjust is carried out
	Device		**Serial Number**	**Head.**	• _ _ _ _ _ _ _ _
				Laser	• _ _ _ _ _ _ _ _
				EvU	• _ _ _ _ _ _ _ _
			Software Revision		• GMM700-X • XXXXXXX XXXX • GMM700/DSP • XXXXXXX XXXX
	Service				• Not defined

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Calibration	**Check cycle**	**Start CCY (Check Cycle)**		• Check cycle for test purposes, e.g. after maintenance (preliminary)
	Zero Adjust	**Start ZeroAdjust**	**Password (1 2 3 4)**	• Zero point determination, e.g. during start-up or after maintenance task based on the zero path
	Zero Adj. Stack	**Start ZeroAdjust**	**Password (1 2 3 4)**	• Only GPP probe: • Zero point determination with measuring device on gas duct
	Box measuring	**Start Meas.**	**Password (1 2 3 4)**	• Check measuring components with test gas via a filter box
	Check cycle	**Start CCY (Check Cycle)**		• Check cycle for test purposes, e.g. after maintenance
Maintenance	**Maint. Mode**	**Mode: Off, On**		• Maintenance operation: On, Off
	Adj. Opt. Align.	**Opt. Alignment**		• Displays optical alignment of SR-unit
	Test Analog Out	**AO 1: 4 mA**		• Tests the analog outputs
		AO 2: 4 mA		
		AO 3: 12.5 mA		
	Test Analog In	**AO 1: 0 mA**		• Tests the analog inputs
		AO 2: 0 mA		
		AO 3: 0mA		
	Test Relay	**Relay 1: On (Off)**		• Tests the relay outputs
		Relay 2: On (Off)		
		Relay 3: Off (On)		
	Test Digital In	**DI 1: Open**		• Tests the digital inputs
		DI: 2: Open		
		DI: 3: Open		
	Push Diag	**RS232**		• Outputs the complete parameter set via the RS232 Service interface
	Reset System			• Restarts the measuring system
	Reset Parameter			• Resets parameters to factory settings **Attention:** All settings are overwritten!

Subject to change without notice

Subject to change without notice

GM700

6 Start-up

Start-up steps overview
Mechanical preparation
Optical alignment
Starting operating mode

Subject to change without notice

6.1 Preparations

This Section describes the standard start-up at the end of which GM700 starts measuring operation.

6.1.1 Required qualifications and further prerequisites

Previous training by SICK or a qualified sales partner is recommended for technicians or engineers planning on performing a start-up. This training provides knowledge so that participants can recognize and handle situations that demand measures going beyond the standard procedures described here. Employees of SICK or trained sales partners can not only manage start-up but can also make recommendations for the current measuring operation as well as determining maintenance intervals based on specific installation conditions.

Standard start-up

Each individual measuring system is already configured to the individual usage conditions at the factory and therefore the standard start-up procedure described in this Section can normally be carried by qualified engineers or measurement technicians without the special training. Prerequisites are:

- Exact adherence to the application requirements specified in the order
- The possibility, during start-up, to ask the advice of a trained specialist from SICK or the respective sales partner should special questions arise that go beyond the normal scope of the standard procedures described.

Start-up procedure overview

After the general preparation which mainly deals with checking the work already carried out, it is then necessary to carry out a zero adjust with the measuring system on a measuring path free from sample gas, the zero path. This can be done either at the sampling point or another location, e.g. in a closed room. At the sampling point itself, the purge air unit, SR-unit and reflector are then put into operation in succession. Finally, the evaluation unit is switched on and checked; the parameters can then be set for the individual demands.

6.2 Start-up steps overview

Prerequisites for successful start-up:

- Installation conditions match the requirements for the measuring system (temperature, pressure).
- Sampling point must be accessible without danger or problems.
- Flanges with tube fitted correctly on the device and reflector side with exact alignment. (Achtung hier Bedingung Cross-Duct)
- All power supply and signal cables installed and connected.
- Apart from the SR-unit, reflector and process windows that are connected later to the duct flanges, the system must be fully installed and with all electrical connections.
- Purge gas supply, when fitted, must be ready for use.
- Provide a zero path with exactly the same length (±2%) as the flange-flange distance; → p. 50, § 6.4.1
- Sampling point technical data must be known:
  - Measuring range
  - Limit values
  - Flange – flange distance
  - Inputs and outputs to be used

Start-up runs in two main steps:

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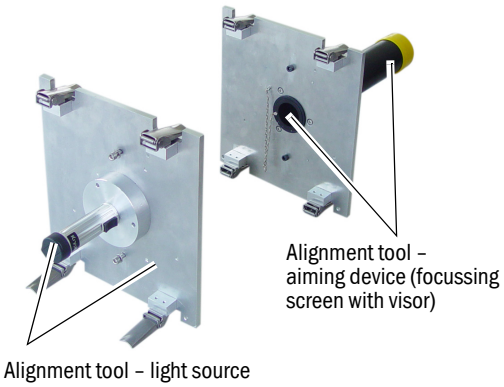
- **1st main step:** Zero adjust on the measuring path free from sample gas (→ p. 58, § 6.4.6)
- **2nd main step:** Installation and start-up at the sampling point (→ p. 58, § b)

Tools and equipment

► Provide the following tools and equipment:

► Optical alignment tool

– Personal protective equipment as required, e.g. for hot resp. aggressive sample gases
– 1 19 mm open-end wrench
– Allen key set
– Insulated screwdriver set for electrical connection work etc.



- Fastening parts included in the GM700 measuring system scope of delivery:
  – 4 each M16 x 60 screws with washers and self-locking nuts to fasten the purge gas fixtures on the duct-side flange with tube
  – For each purge gas fixture: 3 nuts with washers and each with 10 cup springs to fasten the purge gas fixtures on the SR-unit resp. reflector
  – Sealing ring to seal the SR-unit, reflector and purge gas fixture connection
- Optical cleaning cloth without detergents, e.g. SICK Part No. 4 003 353

6.3 Mechanical preparation

WARNING: Avoid hazards through sample gases!
To avoid health hazards, the following work step may not be carried out during the preparation described in this Section but first within the scope of the respective descriptions in the following Sections:

► Connect the power supply to the SR-unit

6.3.1 Checking the scope of delivery

► Check the SR-unit and reflector to ensure they are in perfect condition.

► Make sure the supply voltages on the type plates of the GM700 device components comply with the installation conditions.

The supply voltage of the GM700 components can be changed between 115 V and 230 V on site by the SICK service personnel when necessary.

6.3.2 Cleaning optical interfaces

► Check the optical interfaces of the SR-unit (the front window) and the reflector for soiling and clean with an optical cleaning cloth when necessary → p. 69, § 7.3.2. Do not use any detergents because these leave invisible residues that could falsify the measuring result. The cleaning cloths can however be moistened with distilled water when necessary.

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Information on fitting the SR-unit and reflector

We recommend installing the SR-unit and the reflector during start-up because these must first be adjusted on a zero path. Installation before start-up is only possible with the purge gas supply in operation.

6.4 Measuring path free from sample gas - zero path

The GM700 must always be adjusted in an atmosphere free from sample gas and dust, i.e. not when the system is fitted on the duct. This means a zero path must be prepared. The only exception to this are newly assembled installation environments that have not been put into operation yet, whereby it can be ensured that the sample gas duct remains flooded with ambient air free from sample gas and dust while the work described below is being carried out.

6.4.1 Preparing a zero path

The zero path is a copy of the measuring path free from sample gas. Whenever possible, the zero path should be located at the sampling point so that the adjustment can be carried out on site.

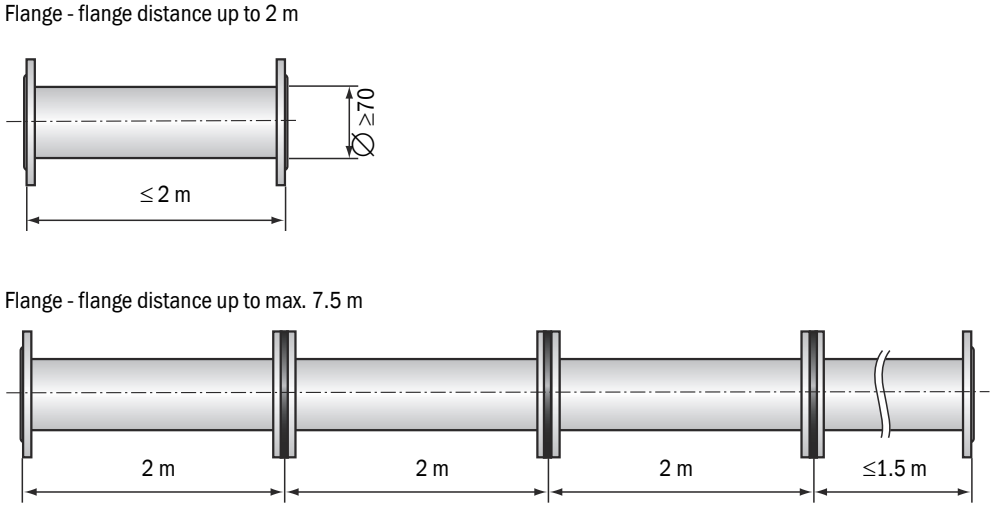
Observe the following when preparing the zero path:

- ► The exact length of the flange-flange measuring path must be known.
- ► Make a tube piece with ∅ 70 mm (use several pieces when necessary) with flanges with exactly the same length as the flange-flange measuring path:
  - – The interior of new tubes must be painted in matt black; rusty surfaces of older tubes do not need to be treated.
  - – Support the tube against sagging.
  - – When not in use, seal the tube to ensure that dust cannot enter it.

> **!** The zero path must be the same length (± 2%) as the flange-to-flange distance. Set the gap between device flange and purge gas fixture to approx. 5 mm so that the cup springs have sufficient pre-loading strength.

- ► Position the zero path near the SR-unit.

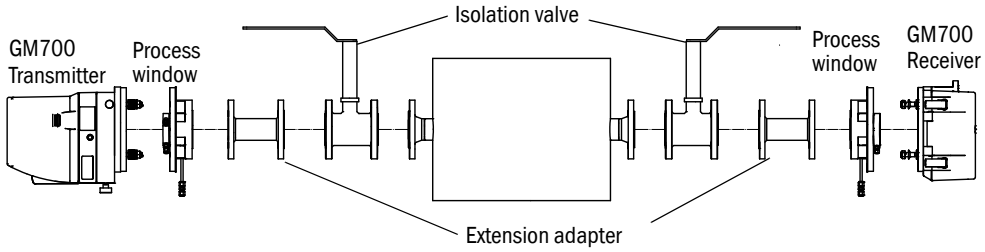
Fig. 19 Zero path



Subject to change without notice

6.4.2 Fitting the GM700 system components

Fig. 20 Installing GM700 system with process window and flange with tube

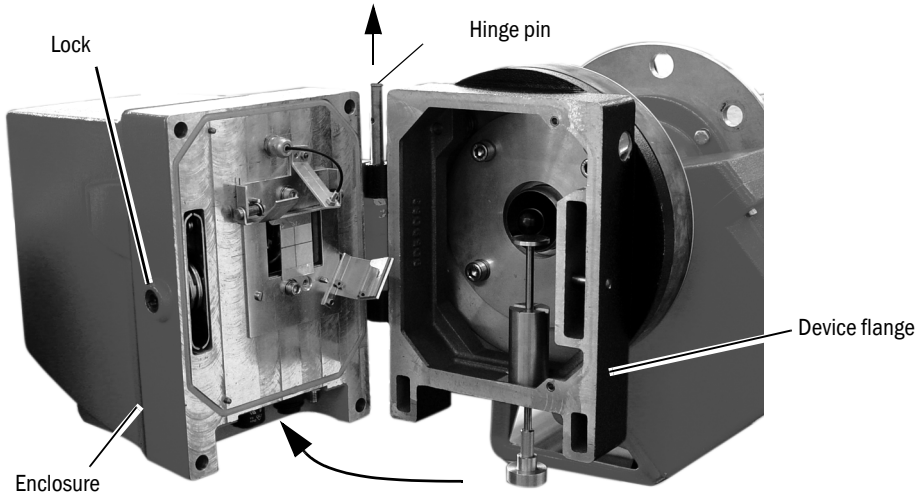


11 Fitting the alignment tool

SR-unit:

- ► Unlock the enclosure lock of the SR-unit and swing the enclosure out
- ► Remove the hinge bolt and take the enclosure off the device flange.

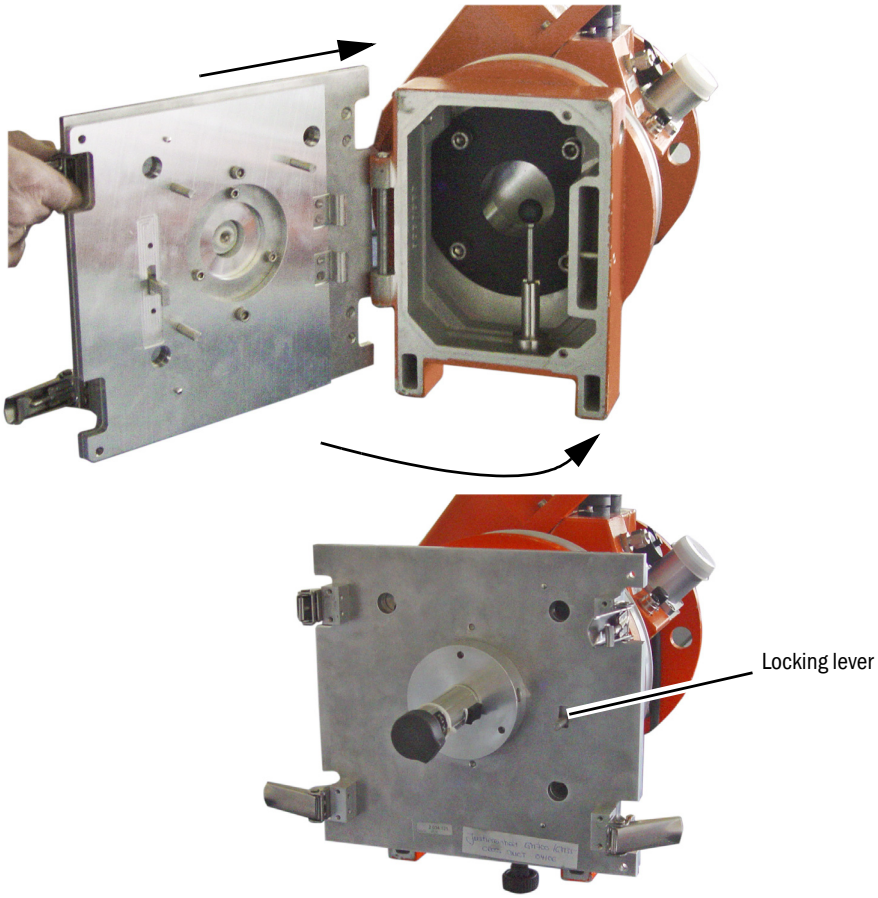
Fig. 21 Preparation of the SR-unit to attach the adjusting device



- ► Position the alignment tool – light source onto the device flange (left side), insert the hinge bolt and swivel the alignment tool in. At the same time, lock properly with the lever.

Subject to change without notice

Fig. 22 Fitting the alignment tool-light source

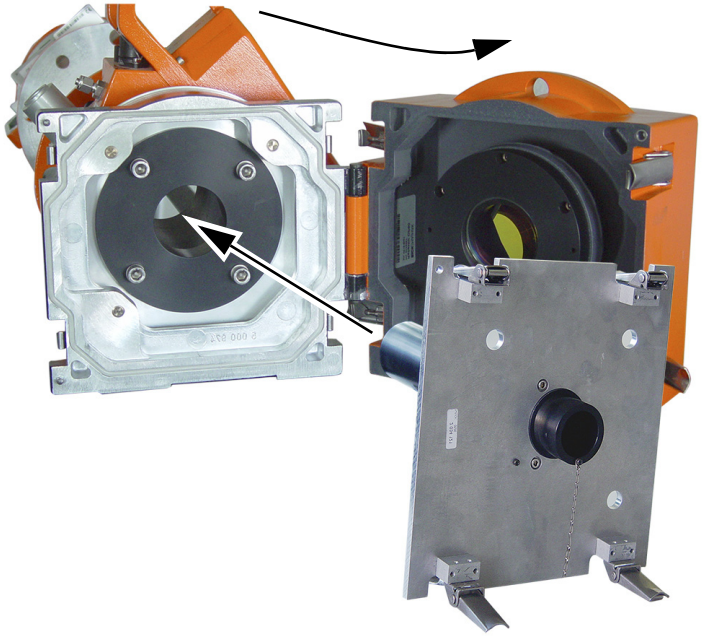


Subject to change without notice

Reflector side:

- ► Swivel the reflector enclosure open
- ► Insert and secure the alignment tool telescope

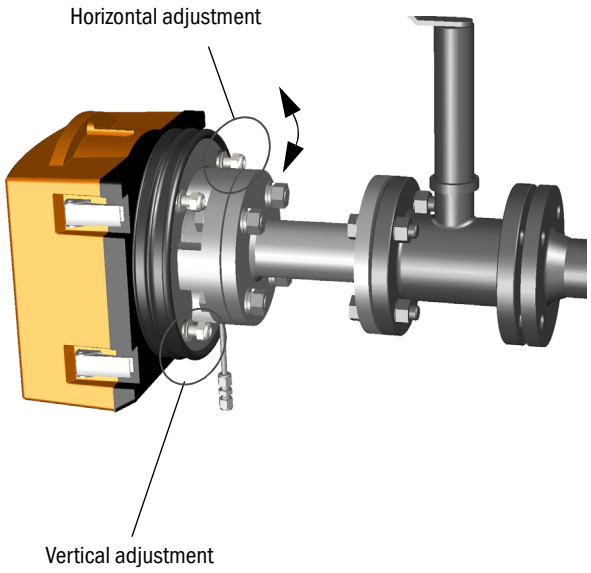
Fig. 23 Fitting the alignment tool telescope (Graphic shows standard GM700 reflector with air purge fixture)



Reflector side:

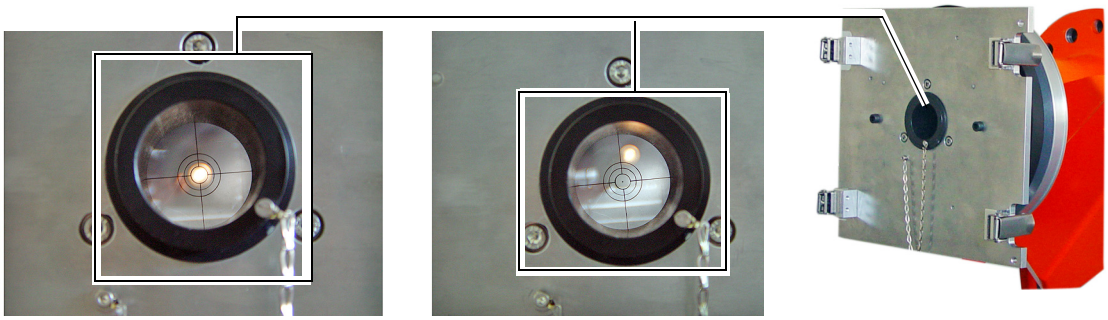
- ► Adjust the two screws of the L adjustment until the light spot in the telescope of the alignment tool appears in the center of the target (→ p. 54, Fig. 25 left).

Fig. 24 L adjustment to align the flange (example: reflector flange)



Subject to change without notice

Fig. 25 Optical alignment – shown on telescope



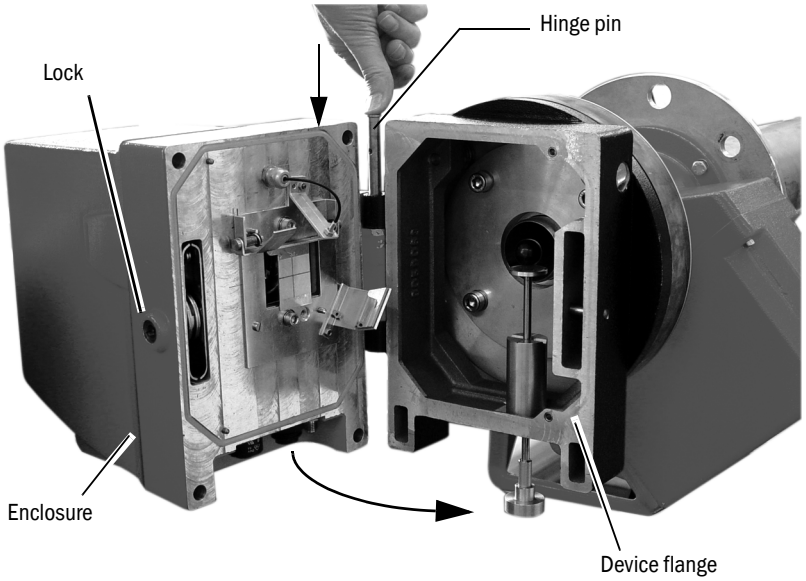
12 Checking optical alignment

- ► Swap the alignment tool on the purge gas fixtures, i.e. now attach the light source to the reflector flange and the telescope to the SR-device flange.
- ► Note the optical alignment on the telescope
- ► If the light point is not central, adjust the screws of the L adjustment accordingly until it is central.

13 Fitting the SR-unit

- ► Fix the SR-unit onto the device flange
  - – Assemble the hinge and insert the bolt
- ► Swivel the SR-unit closed and lock the enclosure using a control cabinet key.

Fig. 26 Fitting the SR-unit

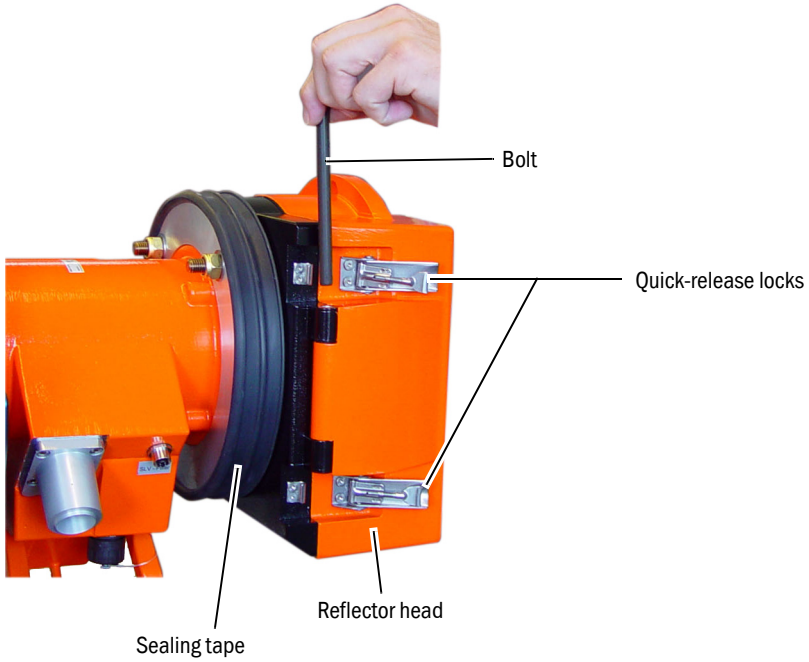


14 Installing the reflector

- ► Attach the reflector to the device flange
  - – Position the reflector head and insert the bolt
  - – Fix the reflector head with the quick-release locks

Subject to change without notice

Fig. 27 Installing the reflector (Graphic shows GM700 standard version)



6.4.3 Optical alignment

6.4.3.1 Optical alignment (for device version for NH_3, HF and O_2 measurement)

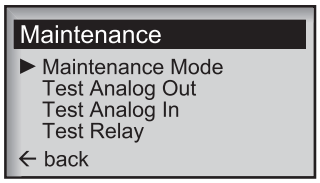
Fine alignment of the optical axis is checked using the visor on the right hand side of the SR-unit enclosure and adjusted using the screws on the mounting flange according to the L-adjustment → p. 55, § 6.4.3.

The power supply for the evaluation unit must be switched on.

1 Switch to Maintenance mode

On the evaluation unit:

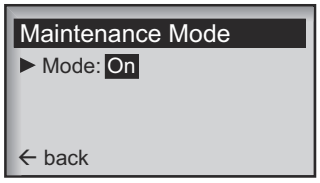
- ► Press button **“maint”**
- ► Select **“Maintenance Mode”**
- ► Activate Maintenance mode



Mode: On (operation on)

2 Align the sender/receiver unit

Using the XY adjustment with internal alignment tool

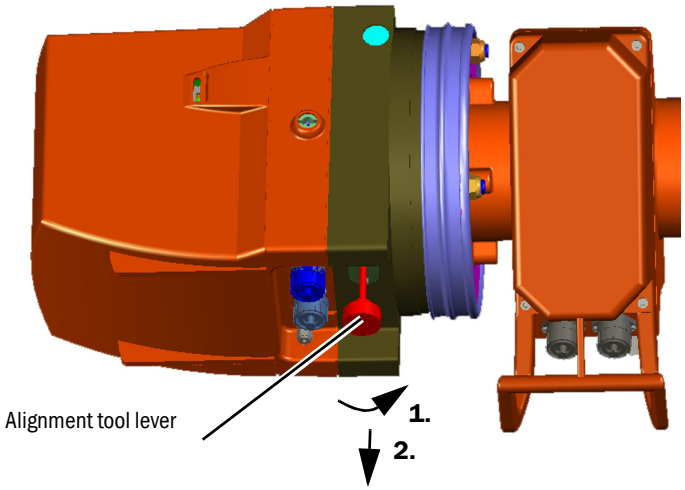


WARNING: Eye injuries possible due to laser radiation

▸ Never open the reflector during operation.

Subject to change without notice

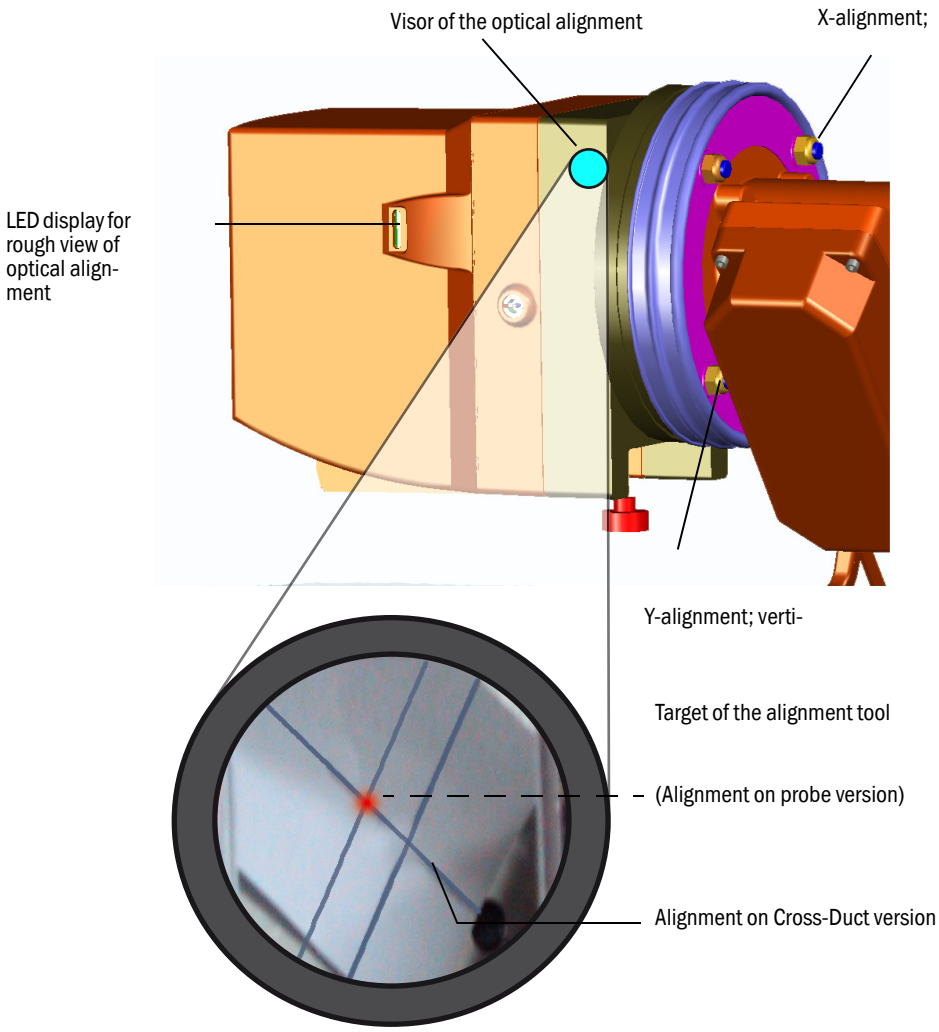
Fig. 28 Using the alignment tool (Graphic shows standard GM700 with purge air fixture)



- First turn (1.) and then pull down (2.) the lever of the built-in alignment tool to bring the alignment tool into adjustment position → p. 56, Fig. 28 above.
- Look through the visor on the right enclosure side diagonally from above at the mirror with the target.
- As shown on → p. 57, Fig. 29, align the position of the light spot (red on the HF and O_2 device version, green on the NH_3 device version). To do this, adjust the nuts on the device flange so the light spot is positioned in the center of the target.
- Only adjust the screws as shown on → p. 57, Fig. 29.

Subject to change without notice

Fig. 29 Using the alignment tool (Graphic shows standard GM700 with purge air fixture)


Visor of the optical alignment
X-alignment;
LED display for rough view of optical align-ment
Y-alignment; verti-
Target of the alignment tool
(Alignment on probe version)
Alignment on Cross-Duct version

- After successful alignment, push the lever of the alignment tool back to its original position and secure it with a quarter turn.

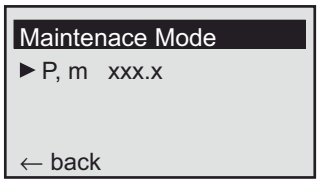
6.4.3.2 Optical alignment of device version for HCl measurement

The wavelength used for HCl measurement is not visible on the target. The power supply for the evaluation unit must be switched on.

1 Switch to Maintenance mode

On the evaluation unit:

- Press button **“maint”**
- Select **Adjust Optical Alignment**
  Maintenance mode/Optical Alignment is active.
  The EvU display switches to display the measuring channel brightness.



Subject to change without notice

2 Align the sender/receiver unit

- ► First turn (1.) and then pull down (2.) the lever of the built-in alignment tool to bring the alignment tool into adjustment position → p. 57, Fig. 29.
- ► Adjust the screws of the purge gas fixture on the flange so that the measuring channel brightness reaches the maximum value → p. 57, Fig. 29.

The LED display of the device side serves as additional aid for rough setting, → p. 57, Fig. 29.

After successful alignment, push the lever of the alignment tool back to its original position and secure it with a quarter turn.

The adjustment, including the warming up time, takes about 2.5 to 5 hours whereby the actual work is completed in less than 30 minutes. Devices with automatic check cycle perform the first check cycle after the warming up phase.

6.4.4 Zero adjust

After successful alignment, push the lever of the alignment tool back to its original position and secure it with a quarter turn.

6.4.5 Preparing the system for zero adjust

As far as supported by the device variant.

At the sampling point

- ► Measure resp. determine the active measuring path, → p. 22, § 3.3.1 and → p. 25, § 3.3.3.1.
- ► Measure resp. determine the length of the flange tube (SR side and reflector side). See, for example, → p. 26, Fig. 8.

6.4.6 Performing zero adjust

After the evaluation unit has been connected to the power supply, a warm-up time of approx. 30 minutes (depending on ambient conditions) is required before zero adjust can be carried out.

- ► After the warm-up phase, align the optical axis as described on p. 55, § 6.4.3.

Select menu **cal**:

- **Zero Adjust** – manual zero adjust (measuring path free from sample gas)
- ► Activate Calibration mode (button “cal”), select menu item **Zero Adjust** and trigger with **Enter**.

- ► Confirm the prompt. Zero point adjustment runs and **Zero Measuring** is displayed.

When zero adjust has completed, either a positive confirmation or an error message is displayed.

Adjustment successful

- ► Switch to Measuring mode or define further parameter settings.

Adjustment not possible

An error message indicates that a malfunction occurred during the adjustment procedure. The flashing “Malfunction” LED indicates that one or more error messages are pending.

- ► Switch to Diagnosis mode and rectify the problem, → p. 83, § 8.
  Starting measuring operation

Subject to change without notice

This Section describes the final preparations at the measuring point at which The Version with measuring probe GM700 starts measuring operation. The SR-unit and reflector with fitted purge gas fixture must already be installed at the sampling point.

WARNING: Follow the work sequence
To prevent damage to health and the measuring system, carry out the steps described in the following in the specified sequence. Always observe the relevant safety information.

6.4.7 Sender/receiver unit and reflector start-up

WARNING: Protection against hazards through hot resp. aggressive gases
- ► Use suitable protective equipment (mask, gloves, working clothing and other) to avoid health risks and other hazards when opening the sample gas duct.
- ► If the protective equipment does not allow safe working on the open sample gas duct under the current conditions or if the duct is in operation and cannot be opened as this would allow gas to escape or air to enter the duct:
- ► Contact the persons responsible to have the sample gas duct shut down for the duration of the installation procedure and, when possible, have the duct flushed with ambient air to ensure the system can be installed safely.

- ► Connect the cable connections as described on p. 55, § 6.4.3 and → p. 36, Fig. 15 and switch the power supply for the sender/receiver unit and reflector unit on.
- ► Switch the power supply on.
- ► Carry out fine alignment according to p. 55, § 6.4.3.
- ► Switch back to Measuring mode with button **meas**

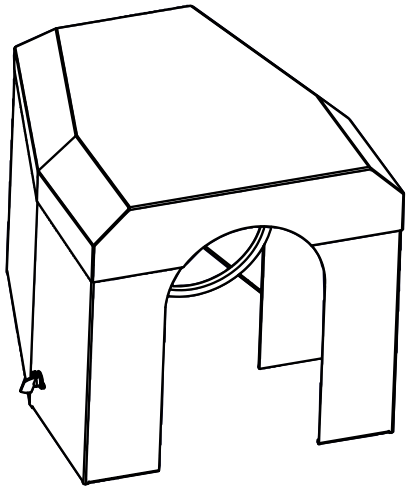
Regular measuring operation now starts.

Subject to change without notice

6.4.8 Fitting the weatherproof cover for the SR-unit and reflector unit

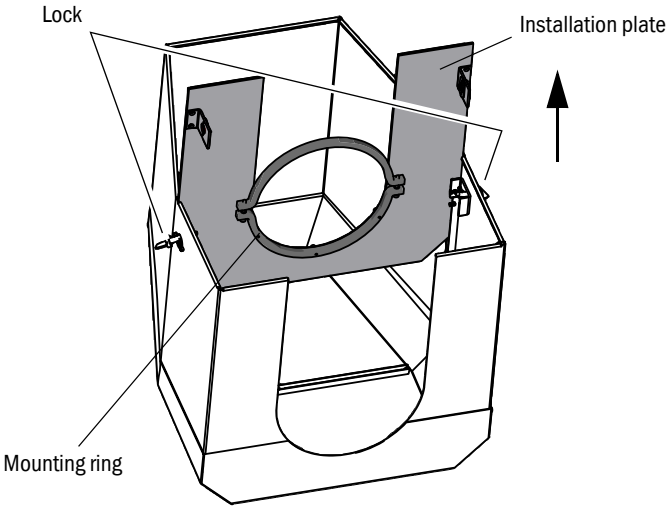
The weatherproof cover is used when the measuring system is operated outdoors. It is available as an accessory.

Fig. 30 Weatherproof cover for GM700 SR-unit and reflector unit



The weatherproof cover is installed in two steps:

Fig. 31 Weatherproof cover for GM700 SR-unit and reflector unit

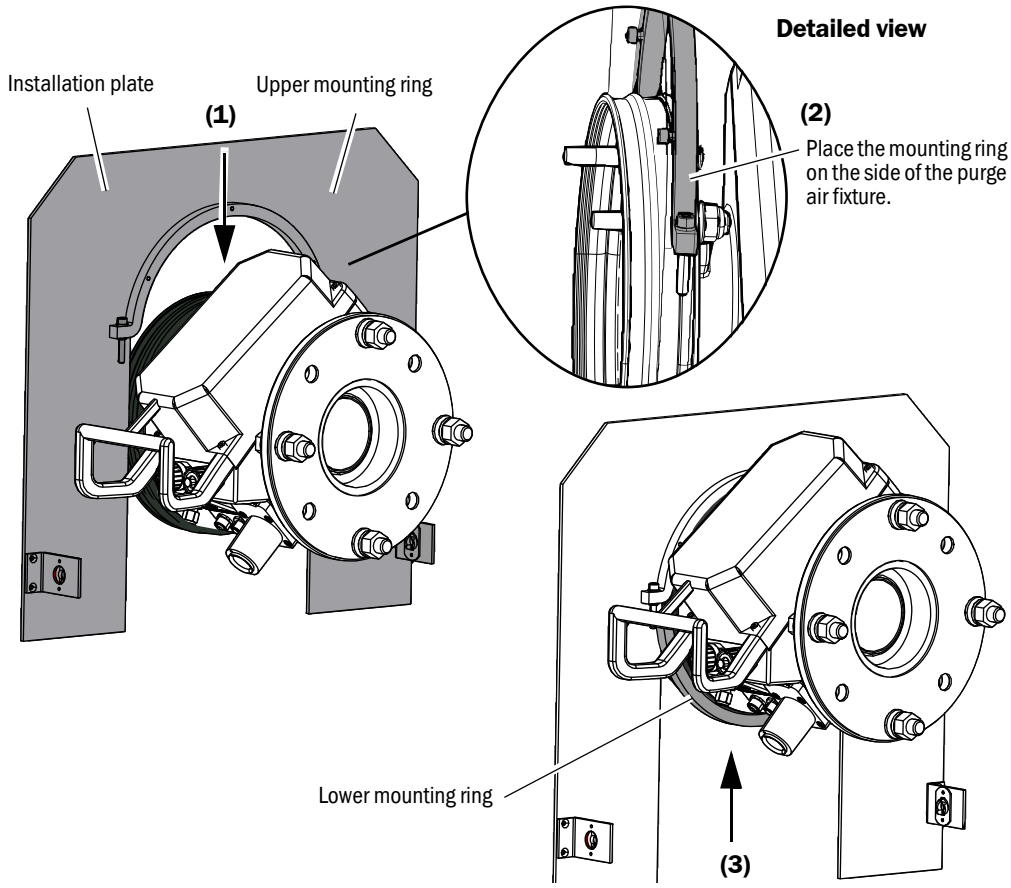


3 Installing the installation plate on the flange of the process window.
   - ► Place the weatherproof cover on the ground turned over.
   - ► Open and unhinge the locks on both sides.
   - ► Pull the installation plate upwards and remove from the cover.

4 Installing the cover

Subject to change without notice

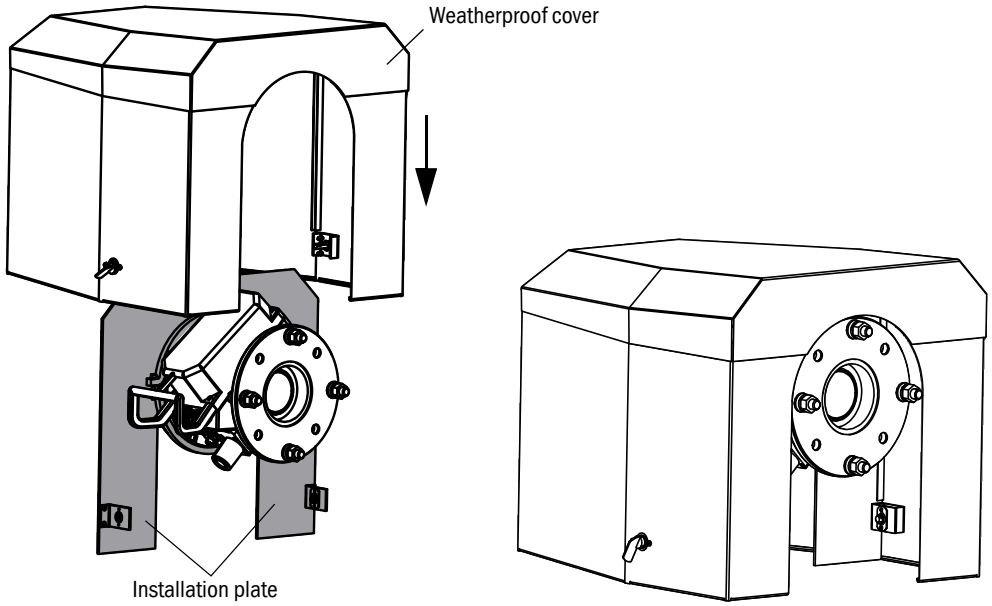
Fig. 32 Installing the cover on the purge air fixture (Graphic shows standard GM700 with purge air fixture)



- ► Remove the lower mounting ring.
- ► Place installation plate **(1)** from the top on the rubber band of the purge air fixture. Place the mounting ring on the side of purge air fixture **(2)**; see detailed view in Fig. 32.
- ► Re-attach lower mounting ring **(3)**.

Subject to change without notice

Fig. 33 Installed weatherproof cover (Graphic shows standard GM700 with purge air fixture)



- ► Place the cover from above on the installation plate.
- ► Click the locks in and close.

6.4.9 Evaluation unit start-up

The evaluation unit is configured with a standard parameter set at the factory and, therefore, is ready to start measuring operation immediately. With the exception of the following steps, therefore, no additional measures are required for start-up for standard applications:

- ► Based on the operator information in »Handling the Evaluation Unit«, §5, check whether the measured value display is correct on the LC-Display.

If error or warning messages are displayed:

- ► Use the operator information on p. 41, §5 as well as the display of error and warning messages on p. 83, §8 to locate and rectify the error cause.

If the error cause cannot be rectified with this information, contact the Service department at SICK or your local sales partner for further advice.

- ► If necessary, parameterize the evaluation unit in accordance with the requirements of the measuring task and the installation environment → p. 41, §5.

6.4.10 Operating states

During actual operation, the following operating states can be shown on the evaluation unit display:

Message in 1st text line	Significance
INIT	EvU initialization
INITIALISATION	Initializing the SR-unit
SIGNAL_ADJUST	Adjusting amplification to changed transmission
MEASURING	Measuring mode
MEASURING LL	Measuring mode with active tracking of laser wavelength (line-locking)

Subject to change without notice

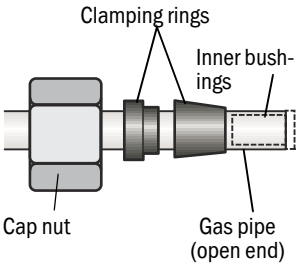
Message in 1st text line	Significance
MEASURING LD	Measuring mode; wavelength tracked (line-locking done)
MAINTENANCE	Maintenance mode (no measurement)
DOWNLOAD	Download new software (for Service purposes only)

6.4.11 Gas connections for oxygen measurement

On the GM700 version for oxygen measurement, the optical paths from the SR-unit and reflector must be purged with nitrogen. The optional N_2 purge unit is available for this purpose, see p. 16, §2.3.

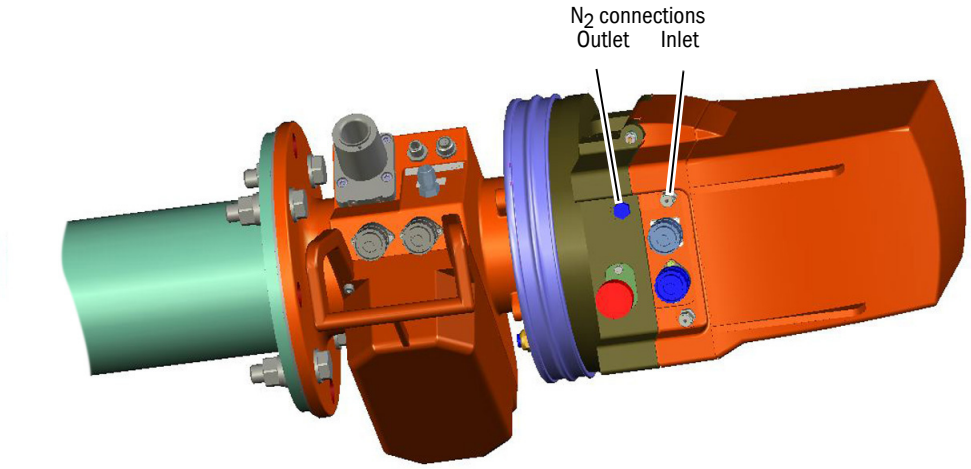
Connecting the nitrogen lines

- ► Connect gas connections on the SR-unit according to → p. 63, Fig. 34.
- ► Proceed as follows:
  - – Take off the cap nut from the gas inlet
  - – Place the cap nut and clamping rings on the open end of the gas pipe
  - – Insert the pipe in the open screw fitting
- ► Tighten the nut with a 9/16” open-end wrench.



When using a gas hose, an inner bushing (Part No. 5309138) must be used to support the hose and clamping ring.

Fig. 34 Gas connections for N_2 (oxygen measurement) on the SR-unit (Graphic shows standard GM700 system)



6.4.11.1 Connecting the nitrogen cylinder

Equipment

- Nitrogen cylinder (N_2 3.0 or better)
- Pressure reducer
- Supply line $^1/_4$" with cutting-clamping ring connection (Swagelok)

- ► Fit a pressure reducer on the nitrogen cylinder and secure the gas cylinder against falling over.
- ► Lay a line between the pressure reducer outlet and the control unit gas inlet using a $^1/_4$" Teflon hose

Subject to change without notice

Connect the gas connection to the “Gas” inlet of the control unit using a cutting-clamping ring connection (Swagelok).

Set pressure reducer to 2 bar.

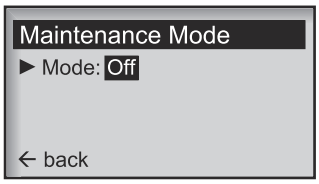
6.4.12 Starting operating mode

On the evaluation unit:

► Switch Maintenance mode off:

Mode: Off

Start Measuring mode by pressing the meas button.



The analyzer now starts in Measuring mode.

► Check for error or warning messages, especially on the status LEDs.

► If error messages are displayed, clear according to p. 83, §8.

► Set parameters, special times and measuring range, → p. 41, §5

Selecting the ambient temperature

> ***NOTICE:*** **Change of temperature range**
> The device performs temperature stabilization after a change of the temperature range. This can take approx. half an hour depending on the environment.
> • Warning message “DEV TEMP“ is output
> ► Wait for half an hour before performing a zero adjust.

On the evaluation unit:

► Select a suitable ambient temperature so that the heater of the SR-unit can stabilize the optics temperatures.

► Activate **Parameter mode.**

► Select menu **Settings**, then **Ambient Temp.**

► Select the temperature range according the Table below that matches the ambient conditions at the measuring location.

Possible ambient temperature ranges (test cuvette)		
Degrees Celsius [°C]	**Kelvin [K]**	**Degrees Fahrenheit [°F]**
–40 ... 10	233 ... 283	–40 ...50
–30 ... 20	243 ... 293	–22 ... 68
–20 ... 30	253 ... 303	–4 ... 86
–10 ... 40	263 ... 313	14... 104
0 ... 50	273 ... 323	32 ... 122

Possible ambient temperature ranges (closed cuvette)		
Degrees Celsius [°C]	**Kelvin [K]**	**Degrees Fahrenheit [°F]**
–40 ... 15	233 ... 288	–40 ... 59
–30 ... 25	243 ... 298	–22 ... 77
–20 ... 35	253 ... 308	–4 ... 95
–10 ... 45	263 ... 318	14... 104
0 ... 52	273 ... 325	32 ... 122

The GM700 determines the appropriate temperature for the optics heater automatically.

Subject to change without notice

► Zero point adjustment:

> ***NOTICE:*** **After changing the temperature range**
> - Warning message “DEV TEMP” may no longer be shown.
> - The temperature change should have been made approx. half an hour ago.

► Activate Calibration mode (button “cal”), select menu item Zero Adjust and trigger with Enter.

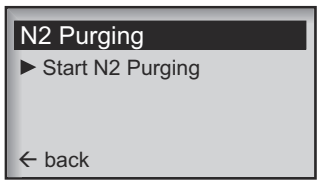
► Confirm the prompt. Zero point adjustment runs and Zero Measuring is displayed.

6.4.13 Starting the increased nitrogen purging for oxygen measurement

> ► Before starting the measuring system, make sure the sealing tape which covers the gap between the SR-unit and flange plate of the sample cuvette sits tight in order to minimize gas consumption.

Evaluation unit

► Press button cal; the GM700 measuring system switches to Calibration mode.

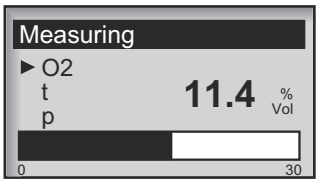


► Call up menu item **N2 Purging** and start it by pressing **Enter** twice.
The display shows the message **N2 Purging active, please wait**.

► Switch to Measuring mode
Make sure the nitrogen cylinder does not run empty. Close off the nitrogen cylinder for safety reasons when the measuring system has been shut down.

The device first performs an initializing cycle after the power supply for all GM700 components (evaluation unit, purge unit) has been switched on. The evaluation unit displays the message **“Initialization”**. This phase takes about 2 minutes and the device then switches independently to Measuring mode and the message **“Measuring”** is displayed.

The display shows the O_2 concentration measured in the sample cuvette, e.g. 11.4 percent by volume.



- Button ↓ serves to display the variables temperature (t) and pressure (p) measured in the sample cuvette as well.
- The bar chart represents a quasi analog display of the selected measured variable – scaled to the measuring range of the analog output. The left digit below the bar shows the measuring range start value and the right digit the measuring range end value.

The display and operating elements are described in detail in Section p. 42, §5.2.

Subject to change without notice

Subject to change without notice

GM700

7 Maintenance

Maintenance intervals
Maintenance work on SR-unit and reflector
Evaluation unit (EvU)
Controlling and tracking the laser working point during measurement

Subject to change without notice

7.1 Maintenance intervals

This Section describes regular maintenance work to be carried out on the GM700 measuring system.

Qualifications

Inspection and maintenance tasks described in this Section can be carried out by Service technicians familiar with the device based on the information in these Operating Instructions and having an in-depth knowledge of the relevant safety regulations.

The maintenance intervals depend on individual application conditions and should be clarified with SICK Service resp. a trained engineer or technician at the local sales partner.

If no other specifications have been made, the following recommendation is applicable:

- Maintenance interval – 4 weeks

7.1.1 Maintenance protocol

Keep a log of maintenance work done. A simple notebook recording the maintenance dates, work done, special observations, and required consumables and spare parts is adequate.

DANGER: Important safety information for all service work

Always observe the following information when carrying out service work to avoid injury or damage to the measuring system:

- ► Wear suitable protective clothing and a protective mask when the sample gas is hot and/or aggressive or has a high dust load, or when the sample gas duct is pressurized. Never open the enclosure or disengage the quick-release locks without taking suitable protective measures.
- ► If the conditions in the sample gas duct are particularly problematic and hinder or prevent work on the open duct, despite the use of protective equipment, the maintenance work must be carried out when the sample gas duct is out of service or after it has been flooded with ambient air.
- ► The purge gas supply must run continuously.
- ► If visual inspection of the power supply cable reveals damage to the insulation or strain-relief clamp, switch off the power supply to the cable in question immediately.
- ► Before opening the SR- or reflector unit, or before cleaning the process windows, make sure the connection to the measuring duct is shut off.

7.2 Preparation and general preparatory work

► Have the following equipment available for service work:

- At least the following tools: 2 x 24 mm open-end or box wrenches, 1 x 19 mm open-end or box wrench, Allen key set, insulated screwdriver set for electrical connection work
- Optical cleaning cloth without detergents, e.g. Part No. 4 003 353
- Distilled water, clean cloths and, if necessary, a dusting brush
- If the duct is pressurized, a suitable protective cover is required for the duct-side flange with tube.
- new flange gaskets, Part No: 2064174 (DiN) or 2064175 (ANSI) and module gaskets, Part No. 2064176

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7.3 Maintenance work on SR-unit and reflector

WARNING: Ensure shut down of process operation or disconnection to process operation before disassemling any part of the GM700 system

- Before disassembling any part of the system for the purpose of checks or cleaning, ensure that process operations are switched off and/or the connection to the duct is shut down using ball valves or other appropriate equipment.

7.3.1 Visual inspection and enclosure cleaning

- Check the enclosure of the SR-unit and the reflector for damage such as cracks for example.
- If a weatherproof cover is used, check its condition.
- Clean contaminated GM700 system components.
- Inspect cables thoroughly for damage and pay particular attention to any signs of abrasion or bending at cable ducts. Prefabricated cables are available as spare parts.

7.3.2 Cleaning the front window on the SR-unit and on the reflector

WARNING: Take care when the duct is pressurized!

- If the duct is pressurized, you must take the appropriate protective measures, in particular shut the connection to the duct off (shutter- or ball valve) or make sure that the process is off and wear a protective mask.
- Prepare a suitable cover for the opening on the device flange of the SR-unit and keep it available.
- Fit the cover immediately on the device flange opening after swiveling the SR-unit open.

WARNING: Eye injuries possible due to laser radiation when the SR-unit is swiveled open!

The retina of a human eye can be damaged when a person looks directly into the laser beam for a longer time.

- **Always** switch the GM700 SR-unit off or **disconnect** the SR-unit CAN cable to the evaluation unit during installation work on the SR-unit or Reflector.

Otherwise this could result in dangerous exposure to radiation.

- **Never** look directly into the laser beam! **Not even** with optical instruments!
- **Never** direct the laser beam at other persons!
- Make sure the laser beam is not aimed at reflecting surfaces.
- See Laser Protection Ordinance according to IEC 60825-1!

- Switch the GM700 off.
- Open the SR-unit enclosure with a control cabinet key and swivel open.
- Check the optical interfaces (front window) of the SR-unit and the reflector for contamination and clean with an optic cleaning cloth as necessary. Do not use any detergents because these leave invisible residues that could falsify the measuring result. The cleaning cloths can be moistened with distilled water if necessary.
- Swivel the enclosures back in and lock to protect the cleaned optical interfaces against moisture and dust.

Subject to change without notice

Fig. 35 Optical interfaces (window) on the SR-unit

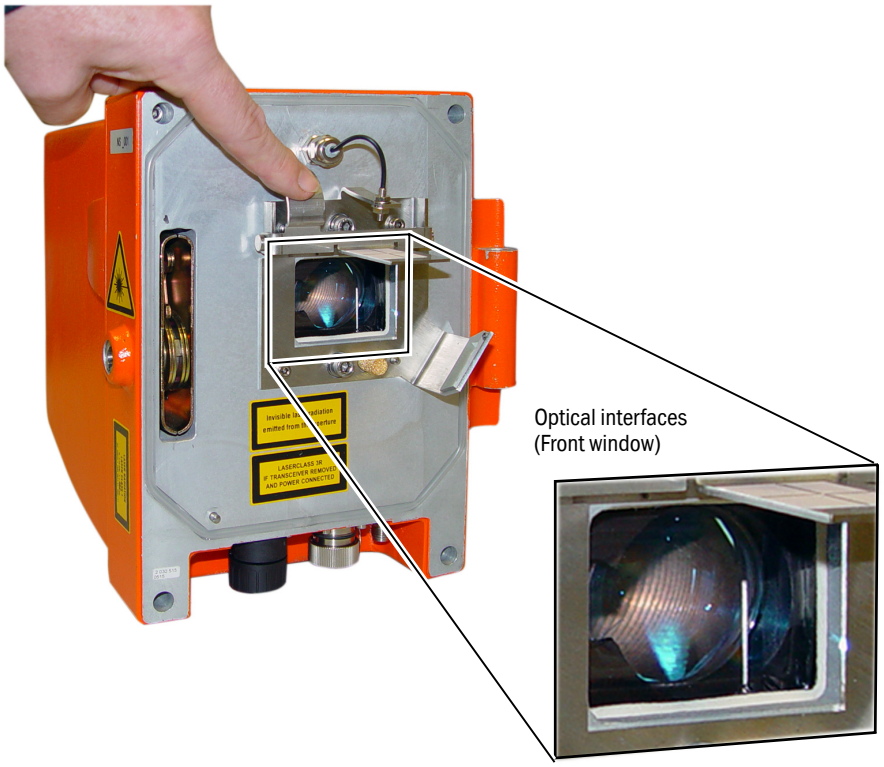
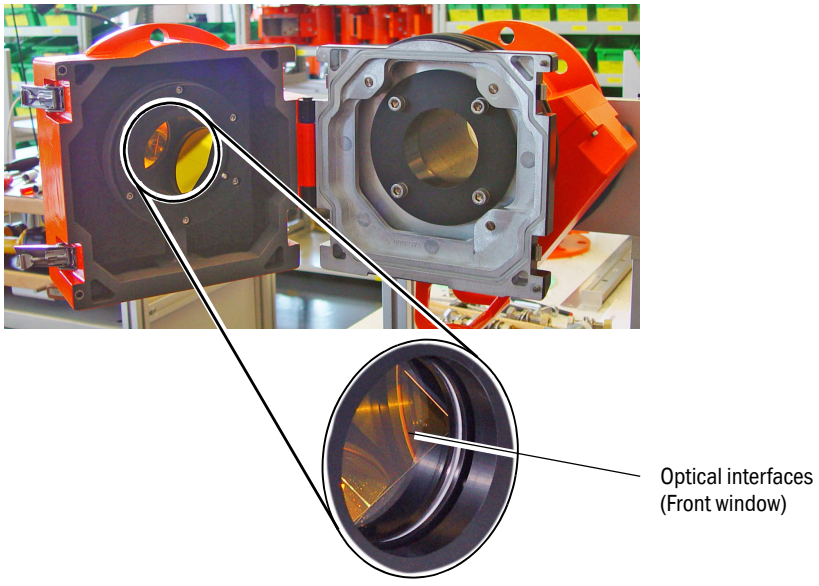


Fig. 36 Optical interfaces (front widow) on the reflector



► Check the zero point setting, → p. 72, § 7.6.

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7.4 Evaluation unit (EvU)

The evaluation unit is designed for maintenance-free operation over the entire service life of the measuring system. If the evaluation unit is mounted outdoors, the following simple checks should be carried out regularly due to the load resulting from changing weather conditions:

- Visual inspection
  - Is the enclosure undamaged and the fitting intact?
  - Does the enclosure front door open and close easily?
  - Is the enclosure window free from moisture?
- Does the illuminated LC-Display on the evaluation unit function correctly?

Exposed electrical connections
The electrical connections are exposed when the evaluation unit door is open. Follow the relevant safety regulations

- Open the evaluation unit door and check the following:
  - Are the cable connections OK?
  - Is the enclosure dry inside?
- If any one of these points is negative, clarify the cause when possible.
- Carry out the necessary repairs.

If the evaluation unit is damaged (e.g. LC-Display failure):

- Contact SICK Service or the local sales representative.

7.5 Maintenance work on process windows

When the GM700 indicates low signal, a contamination of the window is one of the probable causes.

Before checking and/or cleaning, make sure the process is off or the flanges are properly closed by shutters or ball valves.

For the cleaning procedure, see p. 68, § 7.2

CAUTION: Non-hazardous conditions during maintenance work
Make sure the maintenance work can be carried out under non-hazardous conditions and with proper clearance.

Any time a connection of a flange or window-/purge module is openend or disassembled, the replacement of the graphite gaskets by new ones is strictly required.

Note: If a window replacement is necessary, the replacement of the entire window module is required

CAUTION: Switch off purge gas supply when isolation valve is closed
In case an isolation valve is installed, the purge gas supply must be switched OFF whenever the valve is closed to prevent window damage due to overpressure.

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7.6 Controlling and tracking the laser working point during measurement

The working point of the laser needs to be tracked when the concentration in the sample gas is not sufficient. This can done:

- Automatically using a permanently filled cuvette in the device on certain device versions

or

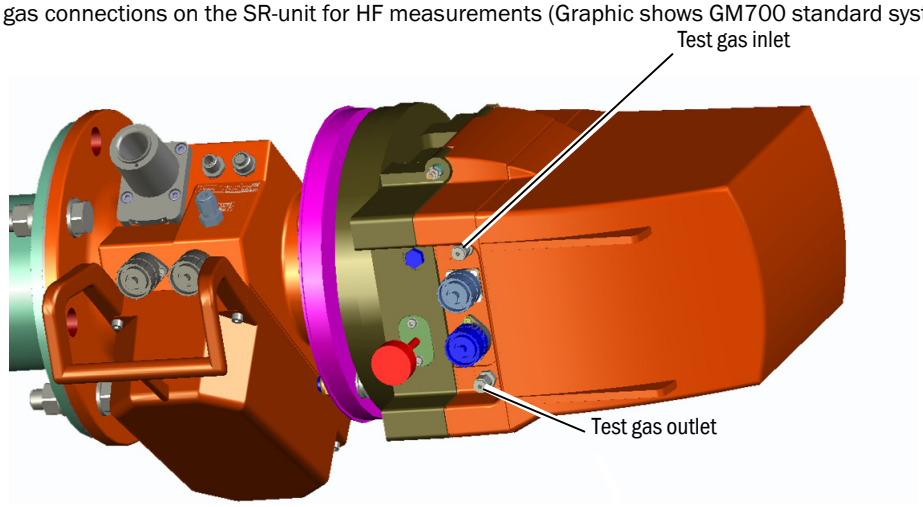
- manually for device versions with a flow cuvette - when the analyzer fails to register a sufficient sample gas concentration over a typical period of 4 weeks. The analyzer is able to determine the position of the absorption line of the gas in the flow cuvette and uses this value to track the laser wavelength (line-locking), that may have shifted slowly due to ageing effects.

This tracking is not a setpoint/actual value comparison with the test gas concentration!

► For HF, use a test gas concentration between 100 and 300 ppm.
► For HCl, use a test gas concentration between 500 and 1500 ppm.

7.6.1 Connecting the test gas

Fig. 37 Test gas connections on the SR-unit for HF measurements (Graphic shows GM700 standard system)

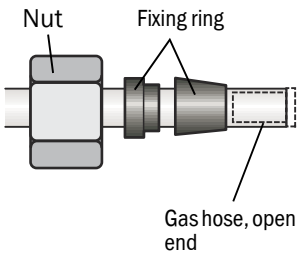


Equipment

- Gas hose:
  - Teflon hose (PTFE), type 650 P 0707, $^1/_8$" or
  - Stainless steel tube, $^1/_8$"
- Pressure regulator
- Test gas cylinder

Connection on the SR-unit

► Connect test gas to the gas inlet:
  - Remove the cap on the gas in let and outlet
  - Position the cap and fixing ring on the open end of the gas hose as shown.
  - Push the hose end into the connection
  - Tighten the nut with a $^7/_{16}$" socket wrench.



► Connect the test gas drainage (i.e. in the sample gas duct) to the gas outlet of the SR-unit.

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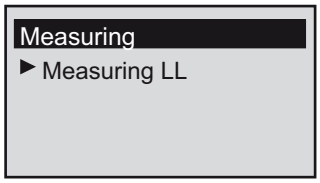
Hazard: Risk to health through HF (hydrogen fluoride)!
► Lead test gas drainage for HF off safely and without hazards, the best method is to lead it back into the sample gas duct!

7.6.2 Starting the tracking procedure

► Open the main valve on the test gas cylinder
► Set the pressure regulator to 250 hPa
  ► Open the low pressure valve on the pressure regulator for about 1 minute
  ► After 2 minutes reopen the valve again for about another minute.

On the evaluation unit:

► Check the display:
  – The message "**Measuring LL**" (for line-locking active) should appear after about 1 minute.



► Open the main valve again for about 1 minute if this message is not displayed.
► Check the display again.
► When the message "**Measuring LD**" is displayed, close the main valve of the test gas cylinder and wait until the pressure regulator is empty.
► Disconnect and remove the gas hoses (or lines).
► Close off the gas connections on the SR-unit again with the caps.

The GM700 system now starts measuring operation.

► Watch for malfunction messages or warnings on the status LEDs of the EvU.
► If malfunctions appear, follow the instructions in the Troubleshooting Table on p. 86 and following pages.

7.6.2.1 Selecting the ambient temperature range

***NOTICE:* Change of temperature range**
The device performs temperature stabilization after a change of the temperature range. This can take approx. half an hour depending on the environment.
• Warning message "DEV TEMP" is output
► Wait 30 min. before performing filter box measurement.

On the evaluation unit:

► Select the appropriate ambient temperature to allow the heater of the SR-unit to stabilize the optics temperature.
  – Activate **Parameter mode**
  – Select **Settings** and then the **Ambient Temp.** menu.
  – Select the temperature range according the Table below that matches the ambient conditions at the measuring location.

Possible ambient temperature ranges (test cuvette)		
Degrees Celsius [°C]	**Kelvin [K]**	**Degrees Fahrenheit [°F]**
–40 ... 15	233 ... 288	–40 ... 59
–30 ... 25	243 ... 298	–22 ... 77
–20 ... 35	253 ... 308	–4 ... 95
–10 ... 45	263 ... 318	14 ... 113
0 ... 50	273 ... 325	32 ... 125

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Possible ambient temperature ranges (cuvette filled with gas)		
Degrees Celsius [°C]	**Kelvin [K]**	**Degrees Fahrenheit [°F]**
–40 ... 15	233 ... 288	–40 ... 59
–30 ... 25	243 ... 298	–22 ... 77
–20 ... 35	253 ... 308	–4 ... 95
–10 ... 45	263 ... 318	14 ... 113
0 ... 52	273 ... 325	32 ... 125

The GM700 analyzer automatically determines the appropriate temperature for the optics heater.

7.6.3 Filter box measurement to check the measuring channels for NH_3, HF or HCl

The gas filter box serves to check the GM700 with test gases.

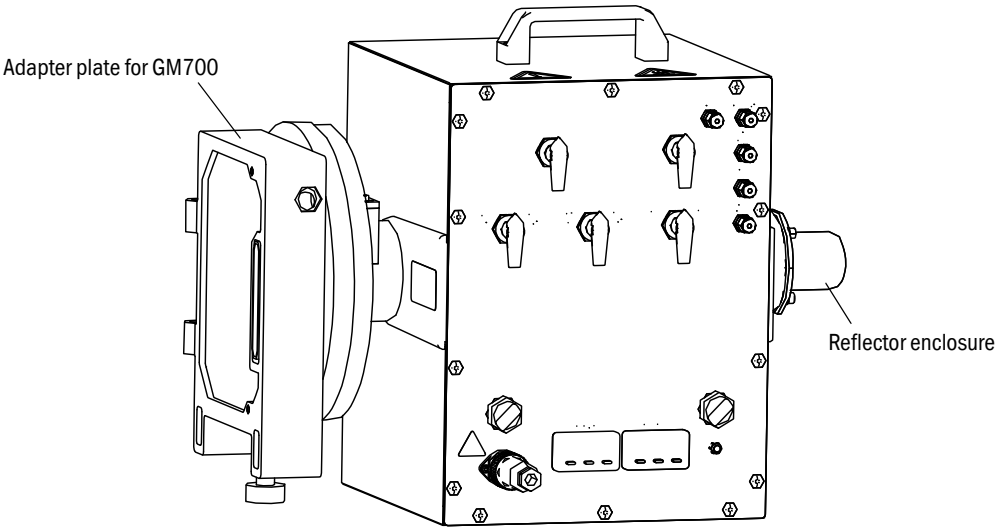
WARNING: The test equipment is not suitable for use in hazardous areas!

Requirements

Components required:

- Reflector enclosure with gold-plated hollow triple reflector; Part No. 2030206
- Filter box with adapter plate for the GM700

Fig. 38 Components required: Filter box for GM700



Measured values are displayed on the EvU in mg/m3 • m (operation),

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7.6.4 Determining the necessary test gas concentration

1 General calculation:

$$\text{Test gas conc. [ppm or \% by vol.]} = \frac{\text{Meas.range [ppm or \% by vol.]} \bullet \text{act. meas.path [m]}}{\text{0.15 m max. filter chamber length}}$$

2 Calculating setpoint values for all 6 chamber lengths:

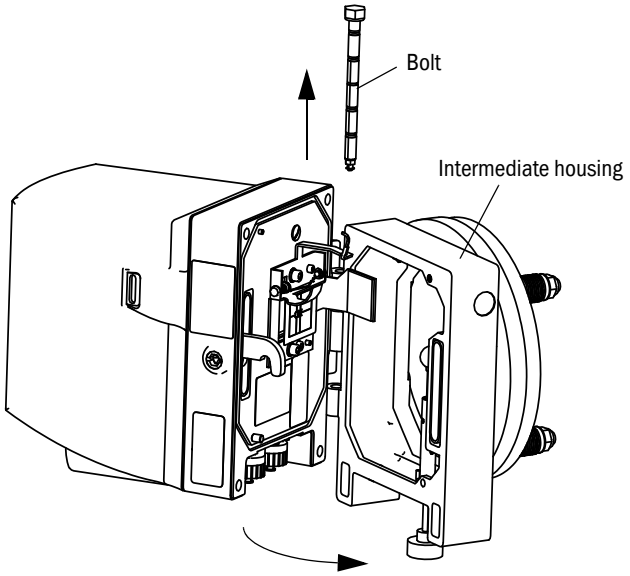
$$CO_{(Target)} = \text{Test gas conc. [ppm]} \bullet 0.758 \bullet \frac{273}{353} \bullet \frac{\text{act. air pressure [hPa]}}{1013} \bullet L\,[mm]_{Chamber} \bullet 0.001$$

Conversion factor depends on the component
NH_3: 0.758, HF: 0.892, HCl: 1.628

Comp.	Required test gas concentration					
	Filter chamber lengths					
	25 mm	50 mm	75 mm	100 mm	125 mm	150 mm
NH_3						
HF						
HCl						

7.6.5 Installing the filter box

Fig. 39 Filter box



► Swivel the intermediate GM700 enclosure open, remove the bolts and take off the intermediate enclosure. Store safely until filter box measurement is completed.

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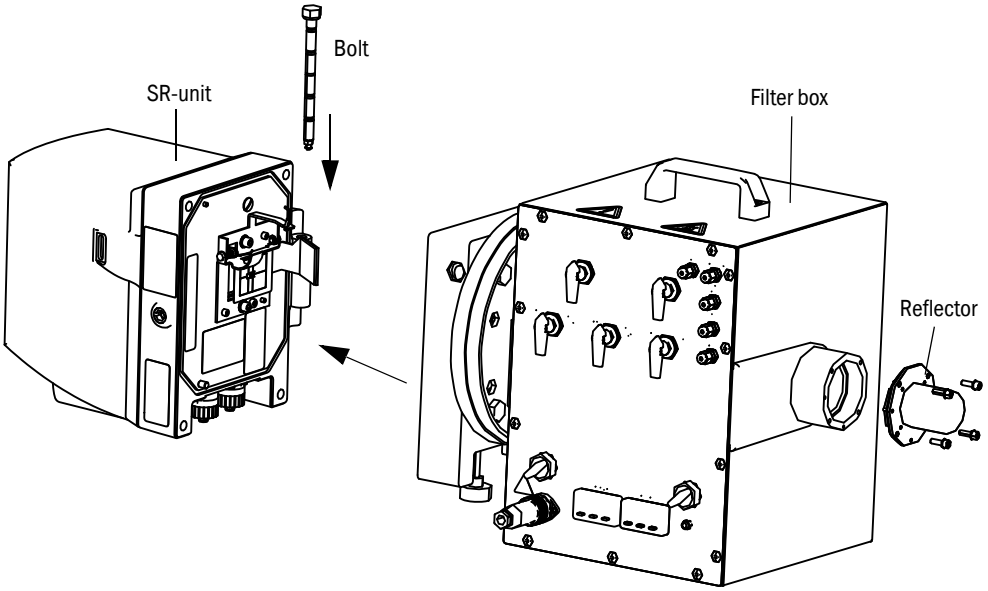
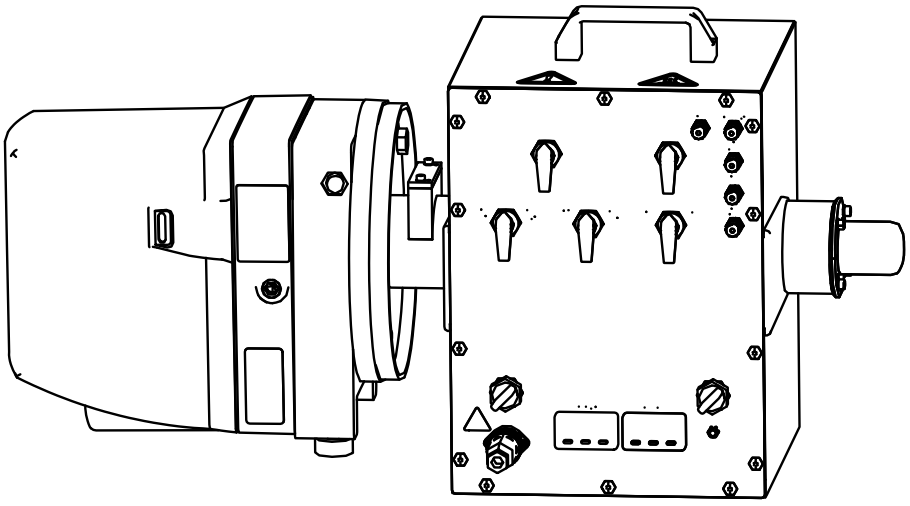
Fig. 40 Installing the filter box on the GM700



- ► Position the filter box with adapter plate on the SR-unit:
  - ► Insert the filter box in the SR-unit hinge
  - ► Insert and fasten the bolt
  - ► Swivel the filter box on the SR-unit in and lock with the locking device
- ► Fit the reflector for GM700 on the filter box.

Fig. 41 Installing the filter box on the measuring device



7.6.6 Carry out filter box measurement

- ► Switch the filter box on; the warm-up phase takes about 2.5 hours.
- ► Switch on the zero gas pump or connect a different zero gas.
- ► Switch all chamber valves to “Zero gas” and the Measure/Purge valve to “Purge”.

On the EvU:

- ► After about 3 minutes, call Box measuring in menu cal (button cal) and select the option “gas”.

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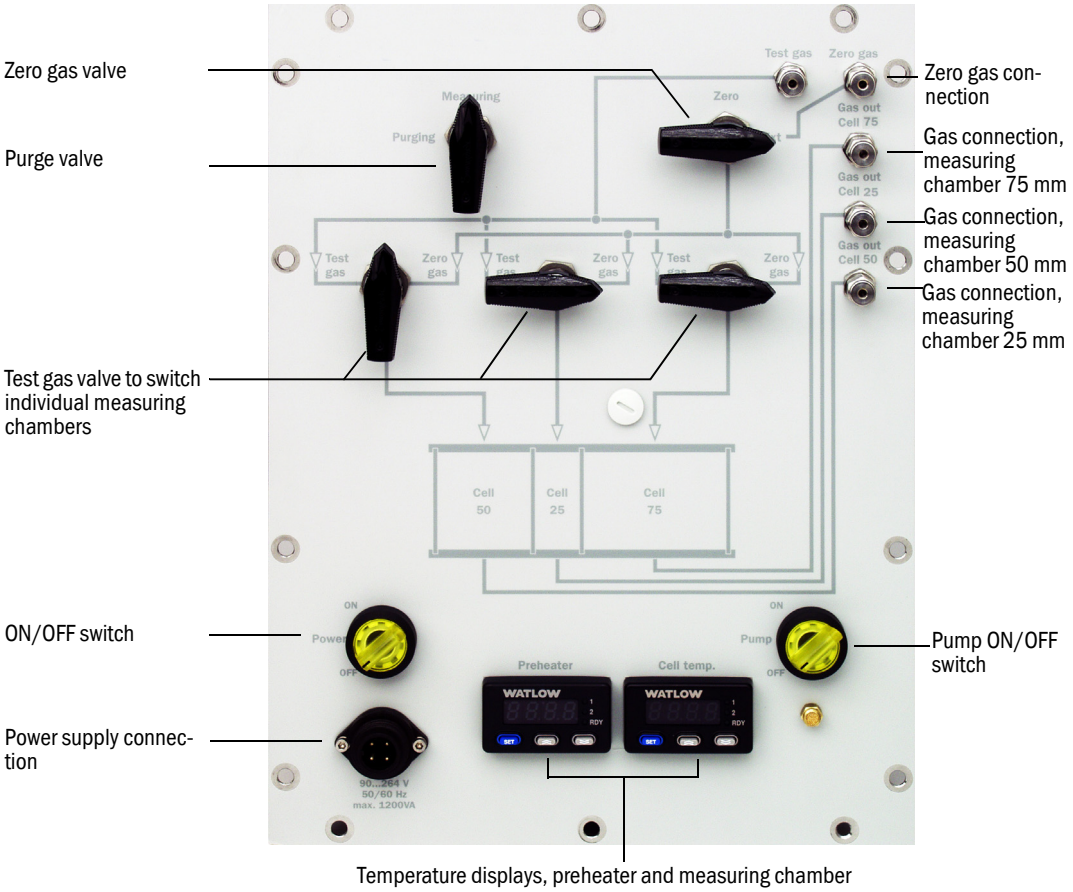
- ► Enter password “1 2 3 4”.
- ► The measuring device now starts a zero adjust and then switches to operating mode “Box measuring”.

Fig. 42 Control elements on the filter box



- ► Connect test gas; set the primary pressure to approx. 1000 hPa (1 bar).
- ► Note the diameters of individual chambers resp. chamber combinations of the filter box and the concentration values; see Section 9.6.1, page 96.
  - ► At the same time, set the respective filter chambers to “Test gas”.
  - ► Switch the Measure/Purge valve to “Purge” for 2 to 3 minutes (until the measured value level has stabilized) and then to “Measure”.
  - ► The overpressure from the purge phase now dissipates.
  - ► When the measured value has stabilized again, read off and note the value.

Restart measuring mode

- ► Purge the filter box with zero gas

On the EvU:

- ► Exit “Box measuring” operating mode with the Return button
- ► Disassemble the filter box with plate and reflector from the SR-unit and store safely
- ► Refit the SR-unit back onto the sampling point in the correct position.

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7.7 Checking the gas analyzer with test cell GMK10

Special characteristics of a measuring component or also the availability of test gases with the precision required for reference materials require the generation of the span gas from aqueous solutions with known content. This is the standard case for GM700-2 (HF).

A test gas system with hose pump, scales and evaporator is required in addition to the heated test cell GMK10 (example: Hovacal).

Requirements

WARNING: Aggressive and corrosive gases

All materials used must be suitable for the measuring components, e.g. HCl, HF.

- ► The manufacturer recommends to exclusively use the evaporator of the test gas system for this check.
- ► The GMK10 is not suitable for use in hazardous areas.

Components required:

- Zero path; Part No. 46483
- Test cell GMK10 with heated sample gas line
- Settings of the test gas system (Hovacal)
  - Consider the following when entering the nominal value of the concentration (mg/m^3):
    - Test cell length of 150 mm
    - Test gas temperature depending on setting (120 ... 140 °C)
    - Measured value output in mg/m3 in the operating state relative to an active measuring path length of 1 m (1000 mm)
  - ► Nominal value input (in the standard state; 0 °C, 1013 hPa) in the test gas system (Hovacal):

    Example: Test value = 5 mg/m^3

    $$\text{Nominal value}_{\text{Test cell}} = \text{Test value} \bullet \frac{1000\ \text{mm}}{150\ \text{mm}} = 5\ \text{mg/m}^3 \bullet \frac{1000\ \text{mm}}{150\ \text{mm}} = 33.3\ \text{mg/m}^3$$

    - The actual display on the device is shown as operating state:

      $$\text{Output}_{\text{Device}} = \text{Test value} \bullet \frac{273\,°\text{C}}{273\,°\text{C} + \text{Temp}_{\text{Cell}}} = 5\ \text{mg/m}^3 \bullet \frac{273\,°\text{C}}{393\,°\text{C}} = 3.47\ \text{mg/m}^3$$

    - Comparison of actual display with entered nominal value:

      $$\text{Test value} = \text{Output}_{\text{Device}} \bullet \frac{273\,°\text{C} + \text{Temp}_{\text{Cell}}}{273\,°\text{C}} = 3.47\ \text{mg/m}^3 \bullet \frac{393\,°\text{C}}{273\,°\text{C}} = 5\ \text{mg/m}^3$$

- Aqueous solution of test component (e.g. 0.01 M for HF)
- Distilled water
- Nitrogen 4.6 or better (compressed gas cylinder)
- Length of hose for safe discharge of the test gas
- Measurement of ambient air pressure

On the evaluation unit:

Set the measuring system to maintenance mode before removing the device from the sampling point.

On the evaluation unit:

- ► Press button **“maint”**
- ► Select **“Maintenance Mode”** and activate maintenance operation

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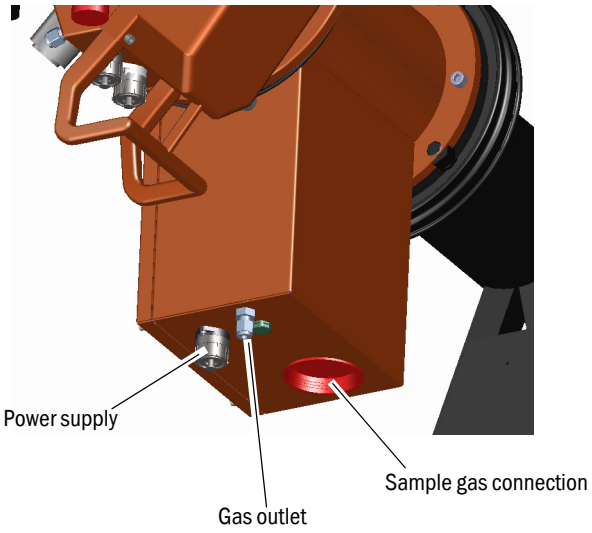
7.7.1 Assembly of the GM700 components with the test cell GMK10

- ► Perform connections on the GMK10:
  - ► Connect the cables for energy supply.
  - ► Connect the sample gas line
  - ► Connect the hose for gas drainage from the test gas system to the gas outlet
- ► Prepare the test gas system and put it into operation. Refer to separate Operating Instructions etc. of the test gas system.

Fig. 43 Connections of the GMK10 test cell



7.7.2 Carrying out measurement

1 Step: Checking optical alignment

> **CAUTION: Endangerment of electrical safety**
> It is possible to perform the check of the GM700 with a separate reflector on a zero tube or a similar construction.
> Independent therefrom, the optical alignment is always performed to the probe position (marking “O, circle” on the target).
> Never open the reflector during operation.
> ► Switch off the voltage supply before opening the reflector.

– The CAN line from the SR-unit to the purge air fixture may not be connected, the system switches to using the default values for pressure and temperature.

- ► If necessary, disconnect this CAN line. Connect the other connections of the measuring system,
- ► Connect the cable for power supply to the GMK10.
- ► Connect the sample gas line from the test gas system.
- ► If necessary, connect the power supply for all GM700 components

2 Step: Settings:

- ► As standard, the temperature of the test cell and the heated sample gas line is 120 °C. Temperatures up to 140 °C are possible depending on the application.
- ► Check the temperature on the GMK10.
  - – Check the temperature indicator on the GMK10 cover.
  - – Set the desired temperature accordingly when the indicator does not show 120 °C,

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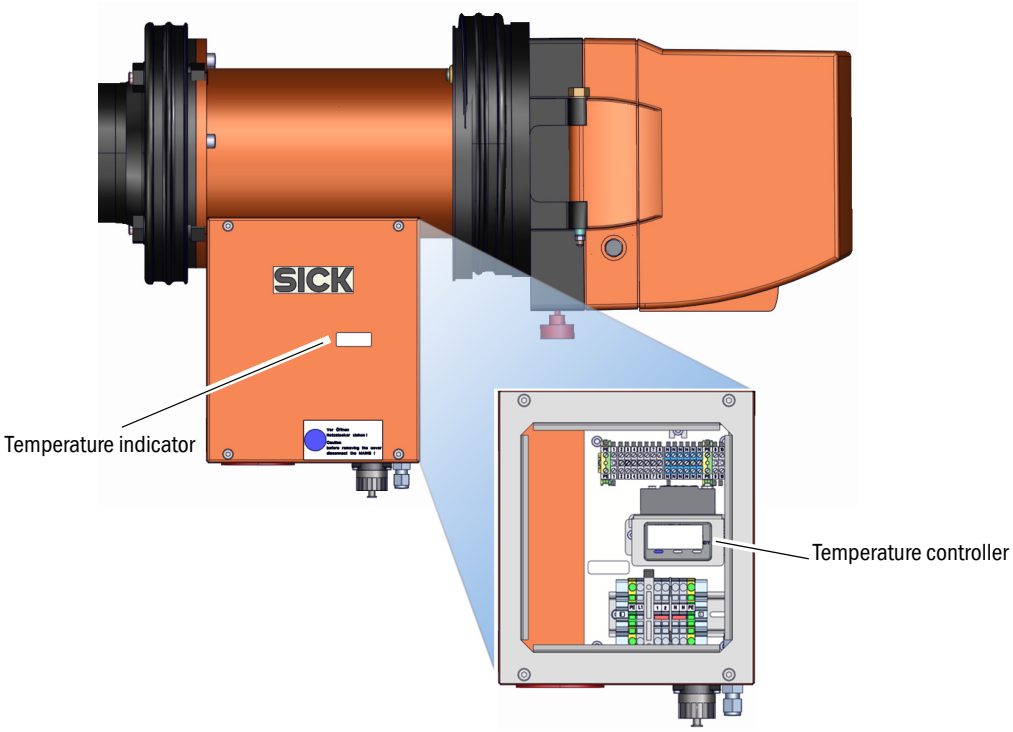
– Remove the cover of the GMK10 and set the temperature on the temperature controller. If required, see separate Operating Instructions of the temperature controller.

Fig. 44 Temperature indicator on GMK10



► On the EvU: Enter the temperature chosen for the test cell, e.g. 120 °C, as default value and enter 1013 hPa as default value for pressure.

3 Step: Set the evaporator temperature on the test gas generator to 180 °C. The test cell is purged with nitrogen during the warming up phase .

Warming up time: Approx. one hour
Measurement can begin after a warming up time of at least one hour. However, we recommend to first purge the system by evaporating pure water.

***NOTICE:* Software version UD81 or higher**
Software version UD81 or higher must be installed in the GM700 measuring system for this procedure!
► See Section → p. 43, §5.2.1 .

4 Step: Perform measurement:

► When stable conditions exist – to be seen by the trend of the measured values – activate boxmeasuring mode on the GM700 EvU

– On the EvU: Call up menu cal with the cal button, activate **„Boxmeasuring“** and start with **„Enter“**.

– Enter password **„1234“**

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The measuring device now starts a zero adjust and then switches to operating mode “Box measuring”. As for each filter box measurement, the system first performs a temporary zero adjust and then changes to boxmeasuring mode. The output of the measured values is performed analog to standard filter box measurement in mg/m3 (during operation, relative to 1 m active measuring path).

► Since the setpoint setting at the test gas system (Hovacal) is "standard", correct the value comparison (ambient) pressure and (test cell) temperature. → p. 11, § 1.4.

Recommendation

- To prevent pressure build-up in the measuring cell, do not use higher flow rates than **4 l/min.** for the measurements.
- Pay attention to the unhindered discharge of the sample gas at the gas outlet.
- The standard solution used for the test must be chosen so that the H_2O concentration of the generated test gas does not exceed 30% by volume at any test point.*Typical value for HF: 0.01M.*

5 Step: Terminate the measurement

After termination of boxmeasuring mode (**“back**” button), the conditions for normal measuring mode are reestablished, e.g. indication of measured value as parameterized.

► Terminate the measurement with the **“back”** button.

► Reinstall the GM700 SR and reflector unit to the purge air fixtures at the sampling point and continue Measuring mode.

***NOTICE:* Purge the measuring system with evaporated distilled water**

► After the end of the measurements, the system **must** be purged with vaporized distilled water until the zero point is reached again!

► Before switching off the heaters, the system must be purged with dry nitrogen for a minimum of 5 minutes.

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GM700

8 Troubleshooting and Clearing Malfunctions

Malfunction categories/possible effects

Purge gas failure

Troubleshooting and clearing malfunctions, evaluation unit

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8.1 Malfunction categories/possible effects

This Section explains how to detect, diagnose and clear malfunctions on Gas analyzers GM700. It is primarily aimed at the operating personnel responsible for the current operation of the measuring system as well as maintenance technicians responsible for clearing malfunctions.

Malfunctions on GM700 are categorized according to their anticipated effects:

Damage to the measuring system itself

Depending on the installation conditions and measuring system version, a purge gas failure could cause damage to the GM700. Section p. 84, §8.2 describes the necessary emergency and protective measures.

8.2 Purge gas failure

Failure of the purge gas supply demands measures to be taken immediately, to protect the measuring system.

- **It might cause a** rapid increase in contamination on the process window

> **It is recommended to install a separation (ball valve, shutter) between duct and analyzer to allow for maintenance work (cleaning) or equipment protection in case of purge gas supply failure or lack thereof.**
>
> **In addition, the purge gas supply connection must be equipped with a check valve to prevent process gas from entering the purge supply tubing.**

8.3 Integrated monitoring and diagnosis system

The GM700 is equipped with an integrated system that constantly monitors the operating state of the SR-unit and evaluation unit. Appropriate messages are generated and logged in the devices for subsequent evaluation should any deviations from normal operating conditions occur. Depending on the anticipated effects, the messages of the system components are categorized into error messages and warning messages: Warning messages are generated if the measurement results are not (yet) directly affected by the change in the system state. Nevertheless, it is important that the cause(s) be investigated and corrected, e.g. by means of maintenance measures, to avoid further malfunctions and damage to the device in particular.

Error messages are generated when measuring operation is no longer possible or no longer reliable. These warning and error messages are stored in the integrated message memory of the evaluation unit.

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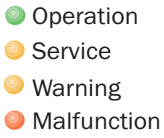
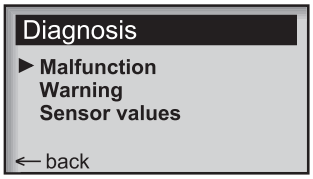
8.3.1 Display and retrieval of messages on the evaluation unit



Diagnosis mode



Component/Tool	Signals	Note
Front panel Evaluation unit	**Warning LED** goes on **Malfunction LED** blinks	Functional impairment on system that will not directly lead to corrupt measured values. Functional impairment on system that can lead to system failure or restricted function.
Error Storage Table	Call menu **Malfunction**	Plain-text message(s) for errors that have occurred to localize and clear the problem. See “Troubleshooting Table”.
Warning Storage Table	Call menu **Warning**	Plain-text message(s) for pending warnings
Output for serious problems (malfunction, error message)	Relay 1 inactive[1)]	Group malfunction

[1)]The relay is active during normal operation (no malfunctions), i.e. the contact is closed.

Troubleshooting Table

If a warning or malfunction is signaled, first call up pending error messages in the Error menu. Then localize the possible cause and clear the malfunction; see Troubleshooting Table.

Error indication	Possible causes	Clearance
• **LED Malfunction** blinks; (**LED Warning** could go on) • Relay 1: **Group malfunction**	Plain-text error messages indicate possible causes	► Start **Diagnosis mode (diag)**: – Call menu **Malfunction** (resp. **Warning**) – Check and clear the specified malfunction.

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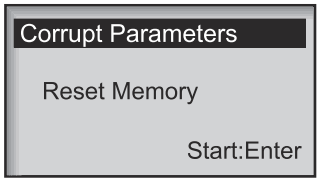
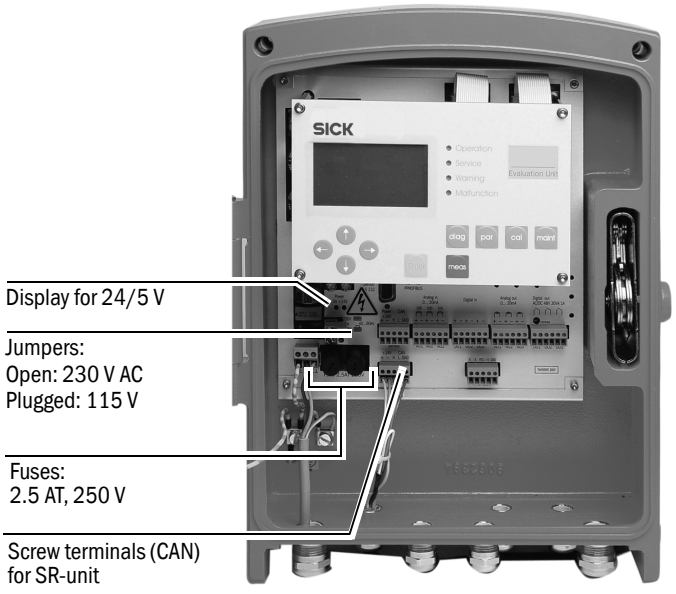
8.3.2 Troubleshooting and clearing malfunctions, evaluation unit

<table>
<tr><td rowspan="7">Evaluation unit not responding</td><td>Evaluation unit:
• Evaluation unit power supply defective</td><td>► Check power supply on all system components:
– If necessary, provide power supply on site
– If necessary, check/reconnect connections on the system components</td></tr>
<tr><td>Evaluation unit:
• Incorrect operating voltage</td><td>► Check operating voltage set on the evaluation unit:
– If necessary, change setting</td></tr>
<tr><td>Evaluation unit:
• Defective fuse</td><td>► Check fuse in the evaluation unit:
– If necessary, replace fuse</td></tr>
<tr><td>Evaluation unit:
• No defect localized yet</td><td>► Disconnect all system components from the power supply and reconnect one at a time
– Check the CAN bus cable from the evaluation unit to the SR-unit resp. terminal box</td></tr>
<tr><td>Evaluation unit:
• Error occurs again</td><td>► Replace the last component connected, contact Service</td></tr>
<tr><td>Evaluation unit:
• 24V/5V supply defective</td><td>► Check 24V/5V supply, replace evaluation unit resp. electronic board module; contact Service</td></tr>
<tr><td> 
</td><td>Evaluation unit:
• Inconsistent data detected in parameter memory</td><td>► Press Enter to restart the system; the factory parameter settings are then active;
► If necessary, reconfigure the parameters
► If the same error message occurs again, replace the EvU unit and contact Service.</td></tr>
<tr><td colspan="2"> 
</td><td>Fuses
► Open the EvU enclosure
► Check fuses and replace when necessary
Power supply
► Check the indicator for the 24 V/5V supply and, if necessary, remove the screw terminal (CAN) of the signal cable to the SR-unit.
► If these indicators only light up when the connector has been removed, check the cabling first.
► If no error is found, connect the system components one by one
– Only connect the cable between the EvU and SR-unit
– Connect the cable to the reflector</td></tr>
</table>

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8.3.3 Error messages

Error message	Component/possible causes	Clearance
Air purge low SLV	The volume flow is below the set limit.	► Check the purge gas supply (blower, hoses), if necessary, exchange filter on purge air blower, → Purge gas unit Operating Instructions.
CD: Filter watch SLV	Low-pressure monitor of purge air unit switches on binary input	► Check the purge gas supply (blower, hoses), if necessary, exchange filter on purge gas blower, → Purge air unit Operating Instructions.
CD: P No Signal SLV	No signal from pressure sensor	► Check connection and cable connection of pressure sensor on purge gas fixture and repair if necessary
CD: P out of range SLV	Sample gas pressure < 500 or > 1200 hPa/mbar	► Check resp. replace pressure sensor
CD: T Air Sign. SLV	Broken sensor resp. no temperature sensor (purge gas temperature) connected	► Check connection and cable connection of temperature sensor (purge gas temperature) on purge gas fixture and repair if necessary
CD: [t] No Signal SLV	Broken sensor resp. no temperature sensor (exhaust gas temperature) connected	► Check connection and cable connection of temperature sensor (exhaust gas temperature) on purge gas fixture and repair if necessary
CDOH: No communication SLV	CAN connection EvU – purge gas fixture SR interrupted	► Check CAN connection; disconnect and reconnect plug, repair if necessary
CDR: No communication SLV	CAN connection EvU – purge gas fixture reflector interrupted	► Check CAN connection; disconnect and reconnect plug, repair if necessary
DSP: BOOT ERROR **DSP…Digital Signal Processor**	Error during start process	► Restart device – Press **maint** button to activate maintenance – Trigger menu **Reset System** or – switch device off and on again ► If not successful, contact Service
DSP: INV PARA	Incompatible software (SR-unit) Invalid values entered	► Check software version, contact Service if necessary ► Correct erroneous values
DSP: NO RESP	Electronics communication problem (SR-unit)	► Restart device, see above ► If not successful, contact Service
EEPROM: CONTROL	Invalid microcontroller parameters (SR-unit)	► Restart device, see above ► If not successful, contact Service
EEPROM: LASER	Invalid laser parameters	► Restart device, see above ► If not successful, contact Service
FIT: DIV BY 0	Error during signal evaluation • Incorrect parameter values • Hardware defective	► Check parameters **measuring distance**, **substitute** for **temperature** and **pressure** and correct if necessary ► Restart device, see above ► If not successful, contact Service

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Error message	Component/possible causes	Clearance
FIT: NO CONV	Error during signal evaluation: • Incorrect parameter values • Hardware defective	► Check parameters **measuring distance**, **substitute** for **temperature** and **pressure** ► Increase parameter **Average** Attention: Only by trained personnel! ► Restart device, see above ► If not successful, contact Service
FIT: S MATRIX	Error during signal evaluation: • Incorrect parameter values • Hardware defective	► Check parameters **measuring distance**, **substitute** for **temperature** and **pressure** and correct if necessary ► Restart device, see above ► If not successful, contact Service
Incompatible device	Incompatible software (SR-unit)	► Check software version ► Contact Service
INIT: NO LINE	No absorption line found	► Restart device, see above ► If not successful, contact Service
LD: PELT ERROR **LD…laser diode**	Temperature measurement on Peltier element defective: • Possible hardware defect	► Restart device, see above ► If not successful, contact Service
LD: TEMP ERROR	Laser wavelength adjustment outside allowed range • Absorption line “lost” • Laser diode defective	► Restart device, see above ► If not successful, contact Service
MEAS: M PLAUS	Measuring results from measuring channel not plausible: • Incorrect parameter values • Strong signal interference • Hardware defect	► Check parameters **measuring path, substitute** for **temperature** and **pressure** ► Increase parameter **Average** Attention: Only by trained personnel! ► Restart device, see above ► If not successful, contact Service
MEAS: R PLAUS	Measuring results from measuring channel not plausible: • Incorrect parameter values • Strong signal interference • Hardware defect	► Restart device, see above ► If not successful, contact Service
MEAS: REF CONC (only for devices with closed cuvette)	Gas concentration in reference cuvette too low	► Exchange reference cuvette ► Contact Service
Sensor communication	SR-unit not connected correctly	► Check CAN connection and repair if necessary

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Error message	Component/possible causes	Clearance
SIG: DARK VALUE	Dark values of receiver element too high: • Possible hardware defect	► Contact Service
SIG: K HIGH	Monitoring channel signal too high	► Contact Service
SIG: K LOW	Monitoring channel signal too low	► Contact Service
SIG: M HIGH	Measuring channel signal too high	► Contact Service
SIG: M LOW	Measuring channel signal too low: • Optical interfaces (front window) of SR-unit or reflector contaminated • Optical axes alignment too inaccurate • Hardware defect	► Clean front window, → p. 69, § 7.3.2 ► Check optical alignment and correct if necessary, p. 55, § 6.4.3 ► If not successful, contact Service
SIG: R HIGH	Reference channel signal too high	► Contact Service
SIG: R LOW	Reference channel signal too low	► Contact Service
Z MEAS: RANGE (only for devices with NH3 measurement)	Unallowed results during zero gas measurement: • Zero gas missing • Optical interfaces (front window) of SR-unit or reflector contaminated • Optical axes alignment too inaccurate	► Check zero gas supply and repair if necessary ► Clean front window, → p. 69, § 7.3.2 ► Check optical alignment and correct if necessary, p. 55, § 6.4.3

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8.3.4 Warning messages

Warning message	Component/possible causes	Clearance
Feed Test Gas	No detectable sample gas concentration (see Interval)	► Feed test gas
FIT: LINEPOS	Deviation of absorption line position: • Line not adjusted perfectly during start process	► Wait until the warning message disappears after a few minutes ► Restart device – Activate Maintenance mode with **maint** button – Trigger menu item **Reset System** or – switch device off and on again – If not successful, contact Service
H2O Undef. **(only for GM700-8)**	Monitoring measurability of H2O: • This warning appears when the gas temperature drops below the switch threshold set	"---" appears on the EvU display. This signals that no value is available. The warning message disappears again as soon as the temperature exceeds the switch threshold
MEAS: REF CONC (only for devices with closed cuvette)	Gas concentration in reference cuvette too low; measurement still possible	► Plan and prepare reference cuvette replacement
DEV: TEMP	Optic of SR-unit out of allowed temperature range: • Warm-up phase after switching on • Ambient temperature too high	► Wait until the temperature has stabilized ► Select different ambient temperature range, → p. 73, § 7.6.2.1 ► Cool device

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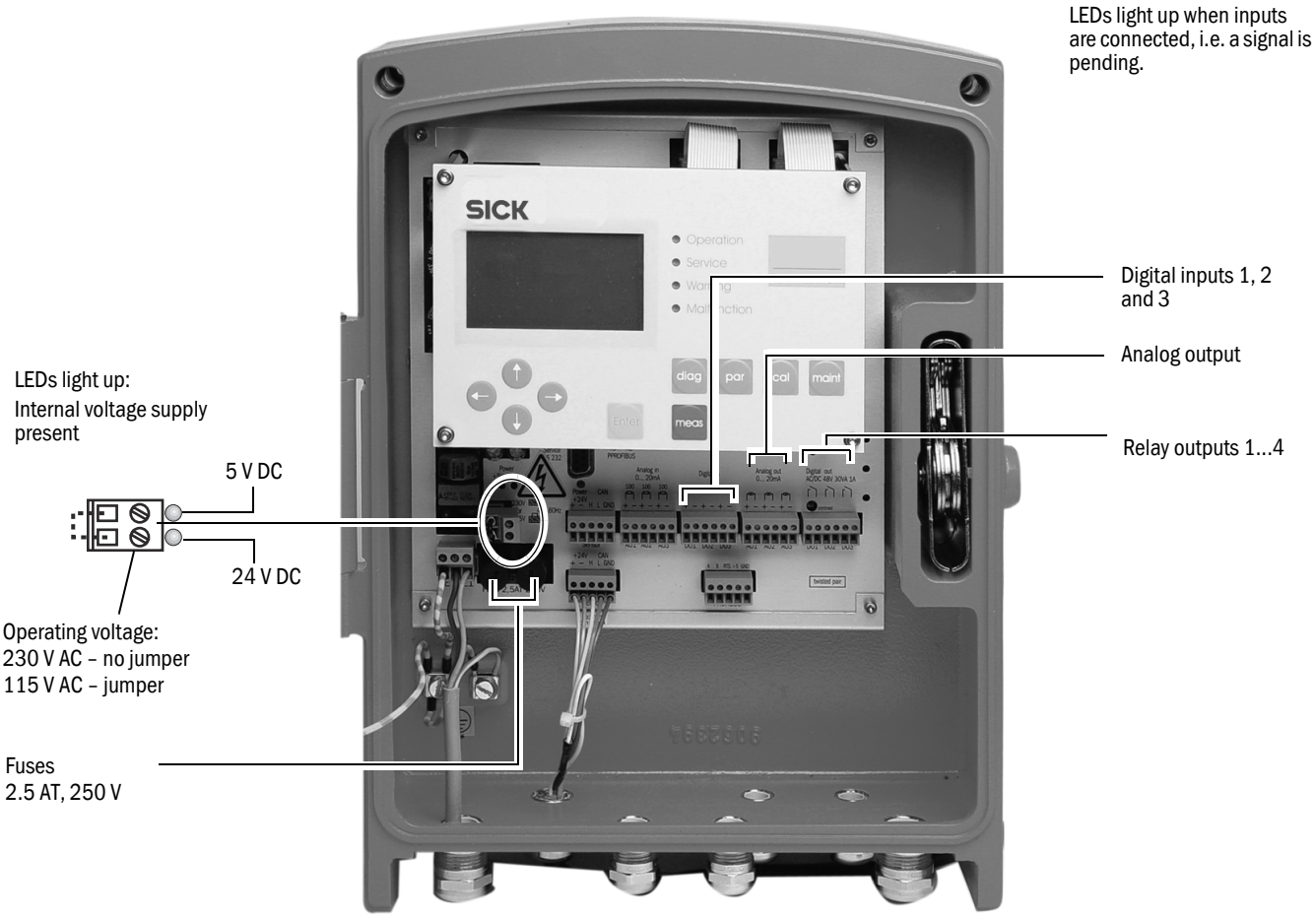
8.3.5 Further tips on troubleshooting

Fig. 45 Troubleshooting the evaluation unit LED displays, signals and fuses



Evaluation unit not responding

- ► Check the power supply on the GM700, check the operating voltage set
- ► Check the fuse in the evaluation unit; check the 24 V/5 V supply indicator in the evaluation unit, when doing so, remove the plug-in terminal on the cable to the receiver.
- ► If these indicators only light up when the plug-in connector has been removed, check the cabling first.

Communication fault between evaluation unit and GM700 SR-unit

Error message: **Sensor Communication???**

Check following connections:

- ► Connection between evaluation unit and SR-unit.
- ► Cable connection on the plug-in terminal in the evaluation unit.
- ► Cable to SR-unit.
- ► Outer plug-in connectors on SR-unit.
- ► Inner plug-in connectors in SR-unit.

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GM700

9 Specifications

Approvals
Measuring components and accuracy
Accessories, expendable and spare parts

Subject to change without notice

9.1 Approvals

9.1.1 Compliances

The technical design of this device complies with the following EC directives and EN standards:

- EC Directive RL 2006/95/EG
- EC Directive RL 2004/108/EG
- EMC Directive 2004/108/EC
- Safety Requirements Electrical Equipment EN 61010-1
- Electrical Equipment for Measurement EN 61326-1

Date of validity: 04.09.2013

9.1.2 Electrical protection

- Insulation: Protection class I according to EN 61010-1.
- Insulation classification: Overvoltage category in accordance with EN 61010-1.
- Contamination: The device operates safely in an environment up to contamination level 2 according to EN 61010-1 (usual, non-conductive contamination, moisture condensation).

9.2 Measuring components and accuracy

Measured data				
Measuring path	Depending on the respective probe			
Measuring range[1)] • Smallest range recommended • Largest range recommended • Min. detection limit • Physical unit	NH_3 0...30 ppm 0...5000 ppm 0.6 ppm ppm, mg/m³, % by vol.	HF 0...5 ppm 0...2500 ppm 0.1 ppm ppm, mg/m³	HCl 0...15 ppm 0...3000 ppm 0.5 ppm ppm, mg/m³	O_2 0...3% by vol. 0...100% by vol. 2000 ppm % by vol.
Stability	relative to measuring range end value ? Zero point: ±2% ? Sensitivity: ±2% (in maintenance interval)			
Accuracy	<2% ... <5%, depending on the application			
Linearity	< 1%			

1)For 20 °C, 1000 hPa, 1 m measuring path

Combination of measuring components

Minimum and maximum measuring range end values are only applicable for single components. Extremely small or large end values for different components cannot be combined in all cases.

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9.2.1 Technical data, GM700 system components

Sender/receiver unit	
Measuring principle	TDLS (Tunable Diode Laser Spectroscopy)
Light source	Laser diode Wavelength:
Reaction time	1 ... 360 s; adjustable
Interfaces	RS232 (service) CAN bus (GM700 components)
Indicators	Status LED (operation: green, maintenance: yellow, malfunction/ error: red)
Protection class	IP 65
Sample gas temperature	0 ... +430 °C
Ambient temperature	Cuvette, filled with gas: –40 ... +52 °C; adjustable in ranges With test cuvette: –40 ... +50 °C; adjustable in ranges
Temperature drift	Max. 10 °C/h
Ambient humidity	<85% rel. humidity (above dew point)
Impact resistance	According to EN 61010-1
Storage temperature	–40 to +55 °C
Power supply	24 V DC, 1.7 A max. (supplied by evaluation unit)
Dimensions	L x W x H: 239 x 272 x 330 mm
Weight	13 kg
ATEX declaration	*ATEX II 3G [Ex op is (x) T4 Gc]IIC*

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Reflector unit	
Reflector material	Gold-coated hollow triple
Protection class	IP 65
Dimensions (L x W x H)	250 x 250 x 155 mm²
Weight	18 kg

Evaluation unit (EvU)		
Connections/interfaces		
Data transmission within the GM700 measuring system		CAN bus Cable length max. 1000 m, electrically isolated, connects EvU, SR-unit
Service interface for PC		RS 232; connection via 9-pole Sub-D socket, modem capability
Analog outputs	3	Output range: 0–20 mA, max. 500 Ω, electrically isolated, live zero can be set to 4 mA
	A1–A3	Measured values; assignment can be set individually
Analog inputs		0 ... 20 mA, 100 Ω, optional for gas temperature, gas pressure
Relays	3	Relay; DC max. 30 W, 48 V, 1 A; AC max. 60 VA, 48 V, 1 A
	R1	Failure (N/C contact)
	R2	Maintenance requirement (N/O contact)
	R3	Function control (N/O contact)
Digital inputs	3	Inputs to connect potential-free contacts (loadable with 24 V; supply from the GM700 evaluation unit)
	DI1	Set device to Maintenance mode
	DI2	Trigger check cycle
	DI3	Unused
Power supply		
Voltage/frequency		115/230 V AC –10%/+6%; 50/60 Hz
Power input		50 VA max.
Dimensions, weight, protection class		
Protection class		IP 65 /NEMA 4 x
Dimensions		See dimensional drawing, p. 98, §9.3 f.f.

Process window module	
Body material	Stainless Steel 1.4571
Windows	Quartz Suprasil, wedged
Dimension	DN50 PN16, resp. ANSI 2“-150LB
Window gaskets	Sigraflex Graphite with sheet metal inlay
Purge gas connection	Swaglok 6 mm
Purge gas pressure	Typically 4 bar, max. 5 bar

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Process window module	
Backpressure from process	max. 500hPa
Gastemperature	max. 550 °C, with purge gas active

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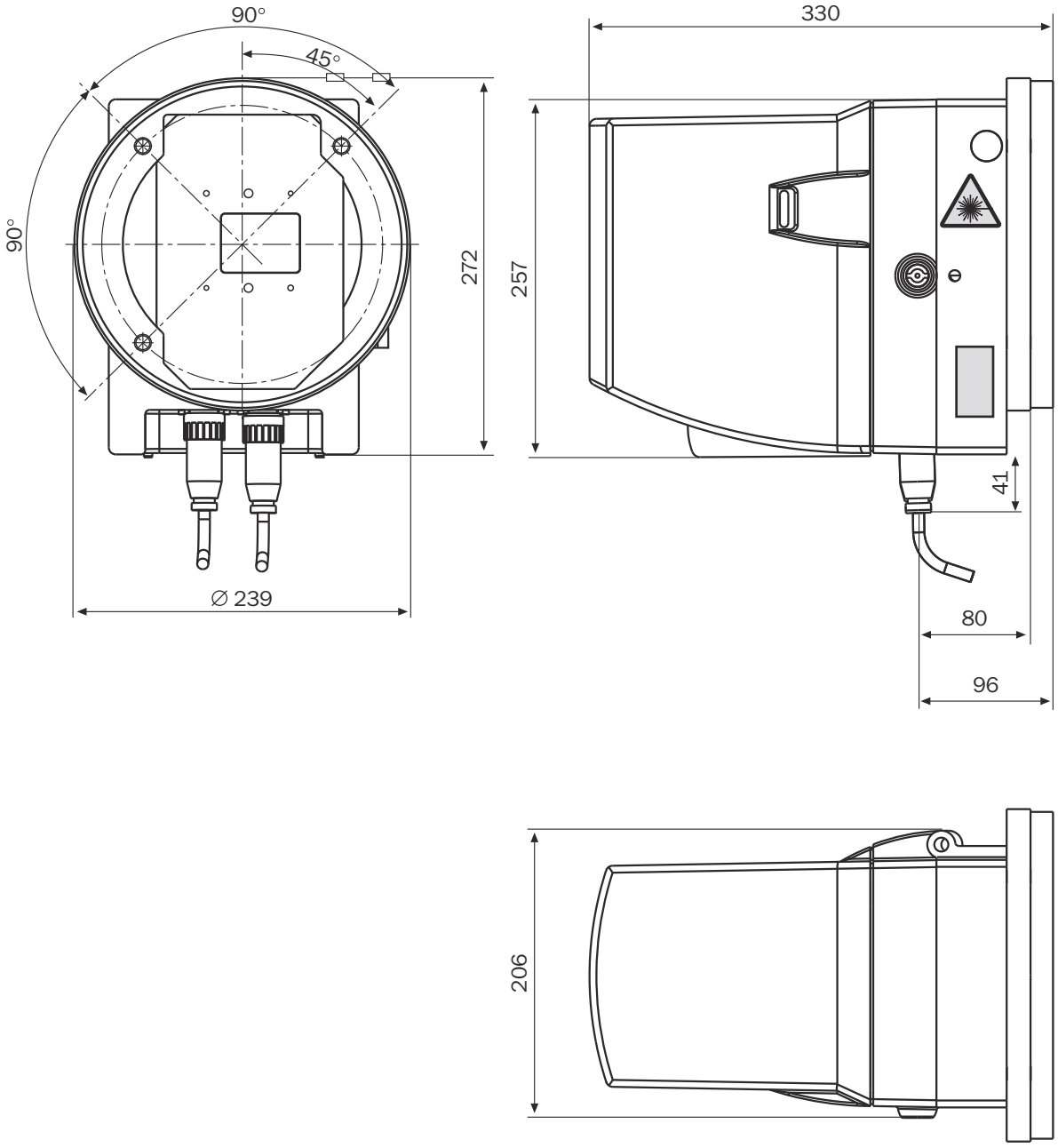
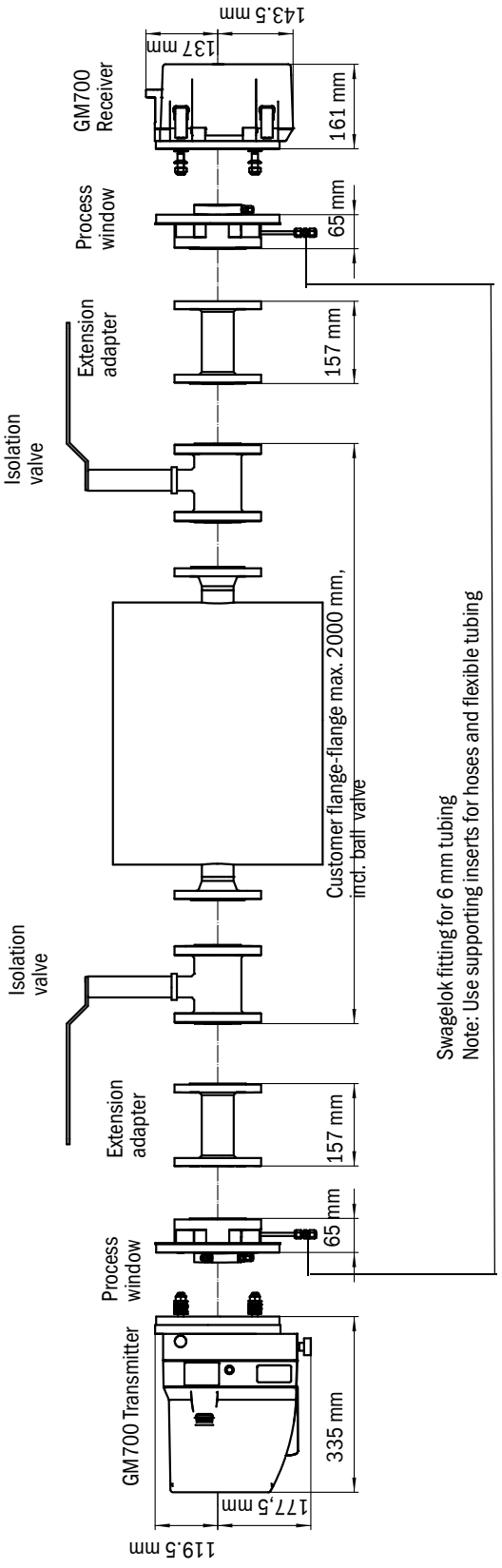
9.3 GM700 sender/receiver unit dimensions



Subject to change without notice

9.4 GM700 Process window system dimensions



Note: In case an isolation valve is installed, the purge gas supply must be switched OFF whenever the valve is closed to prevent damage due to overpressure!

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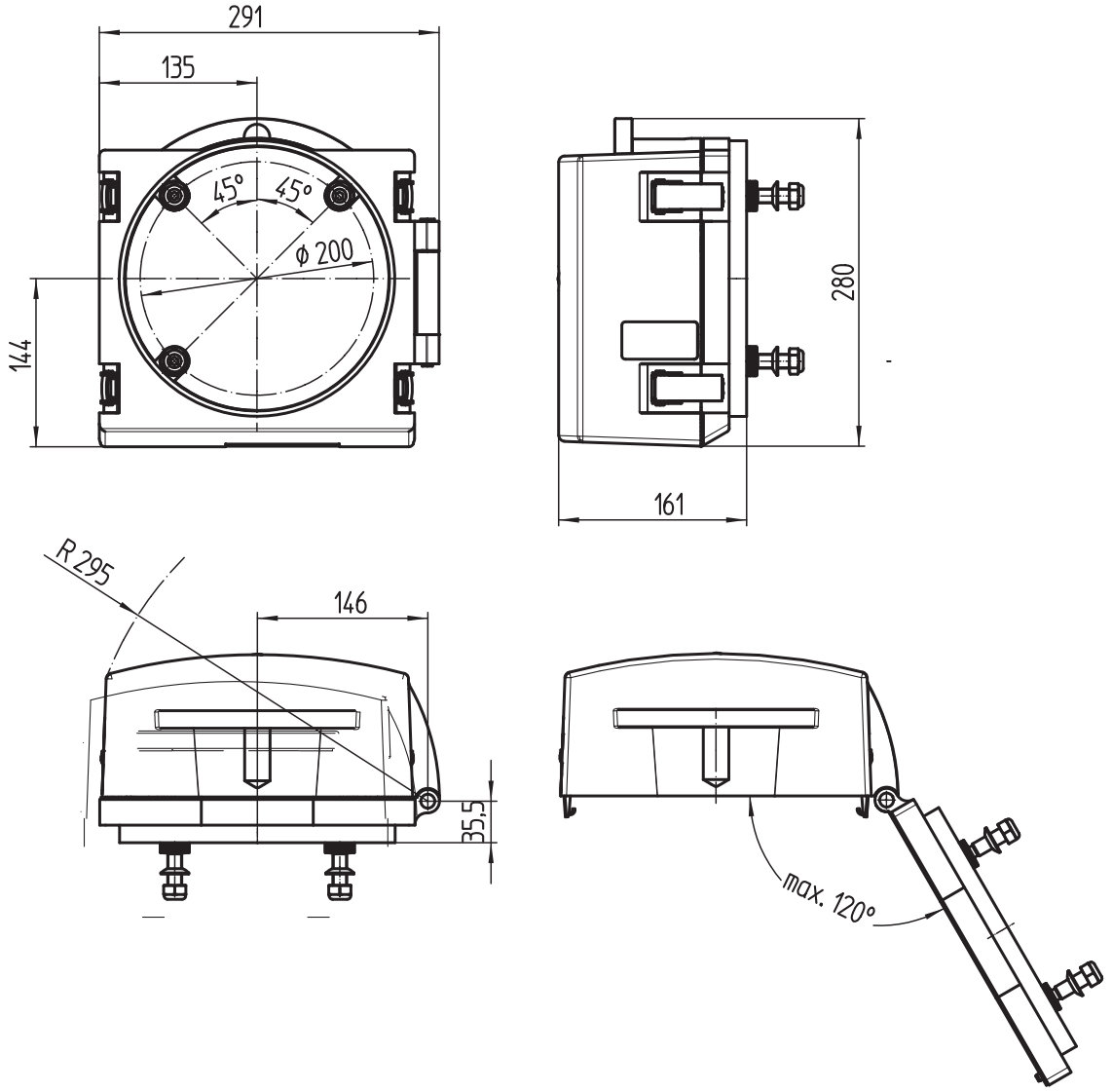
9.5 Reflector dimensions



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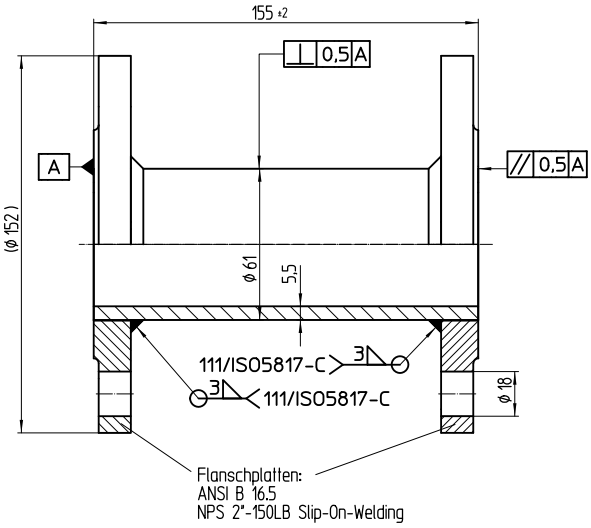
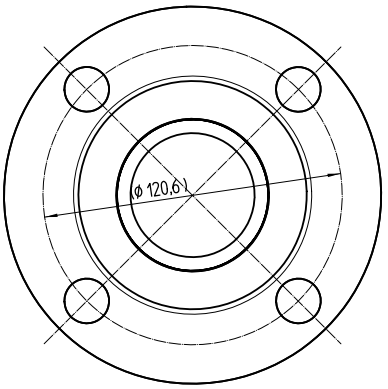
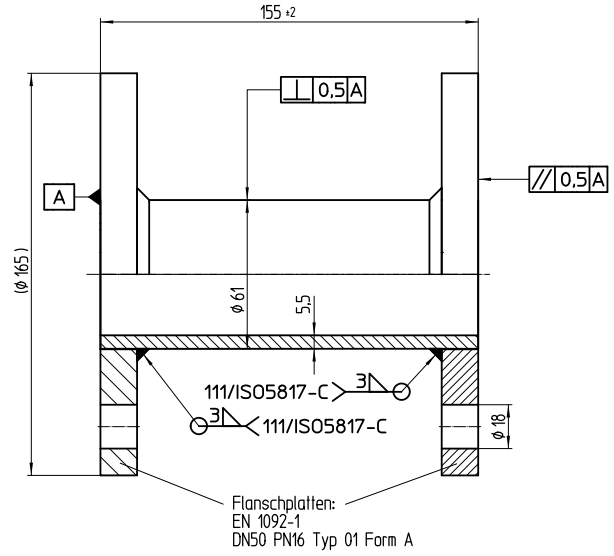
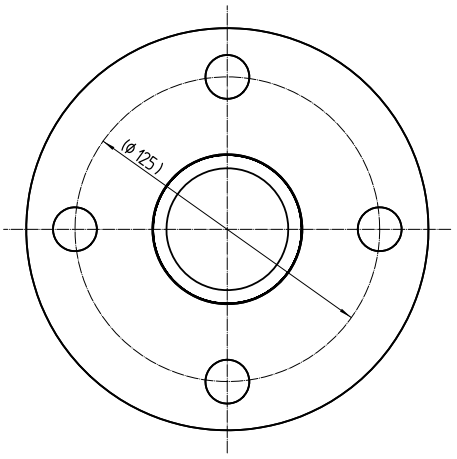
9.6 Flange extension adaptors



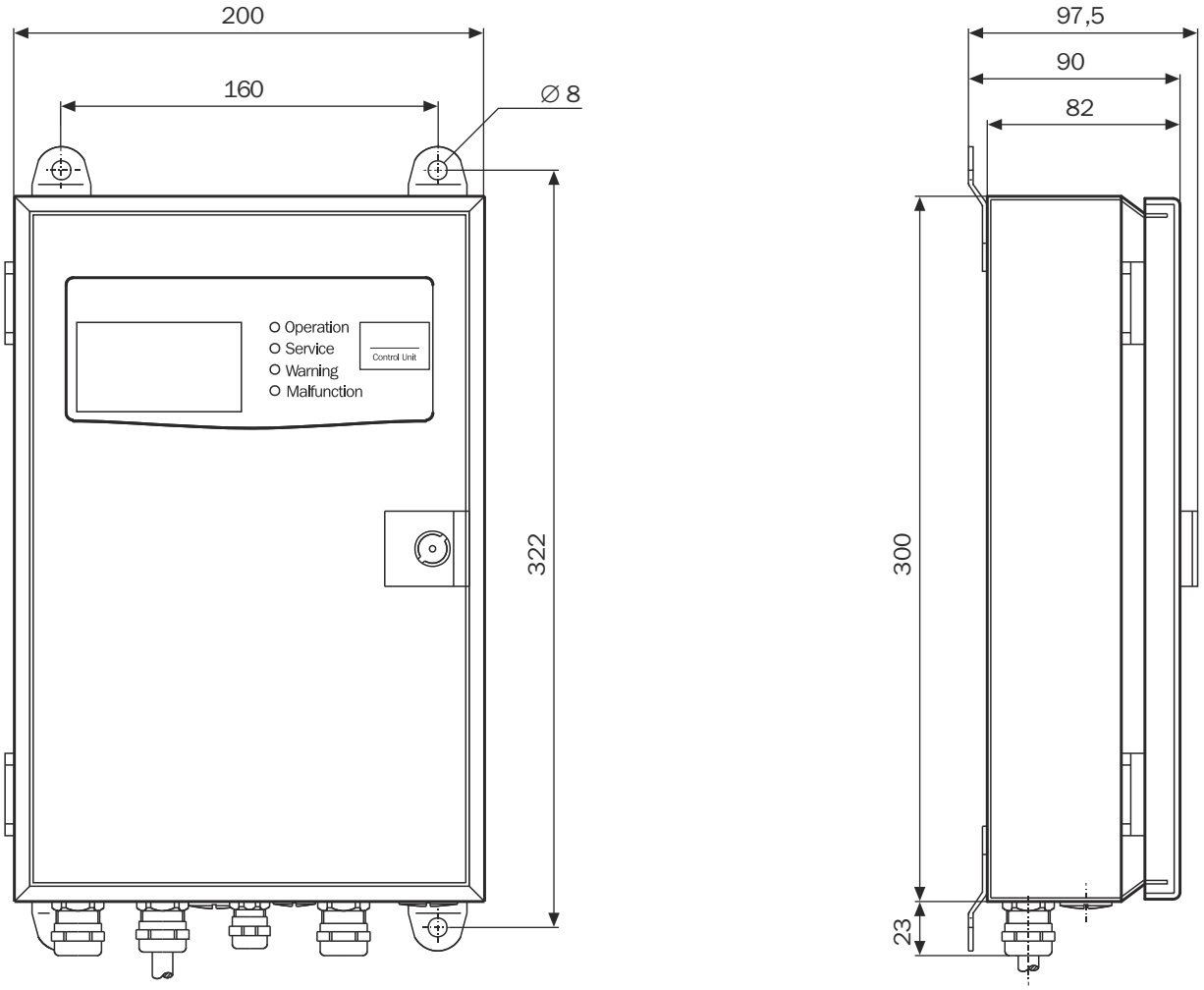






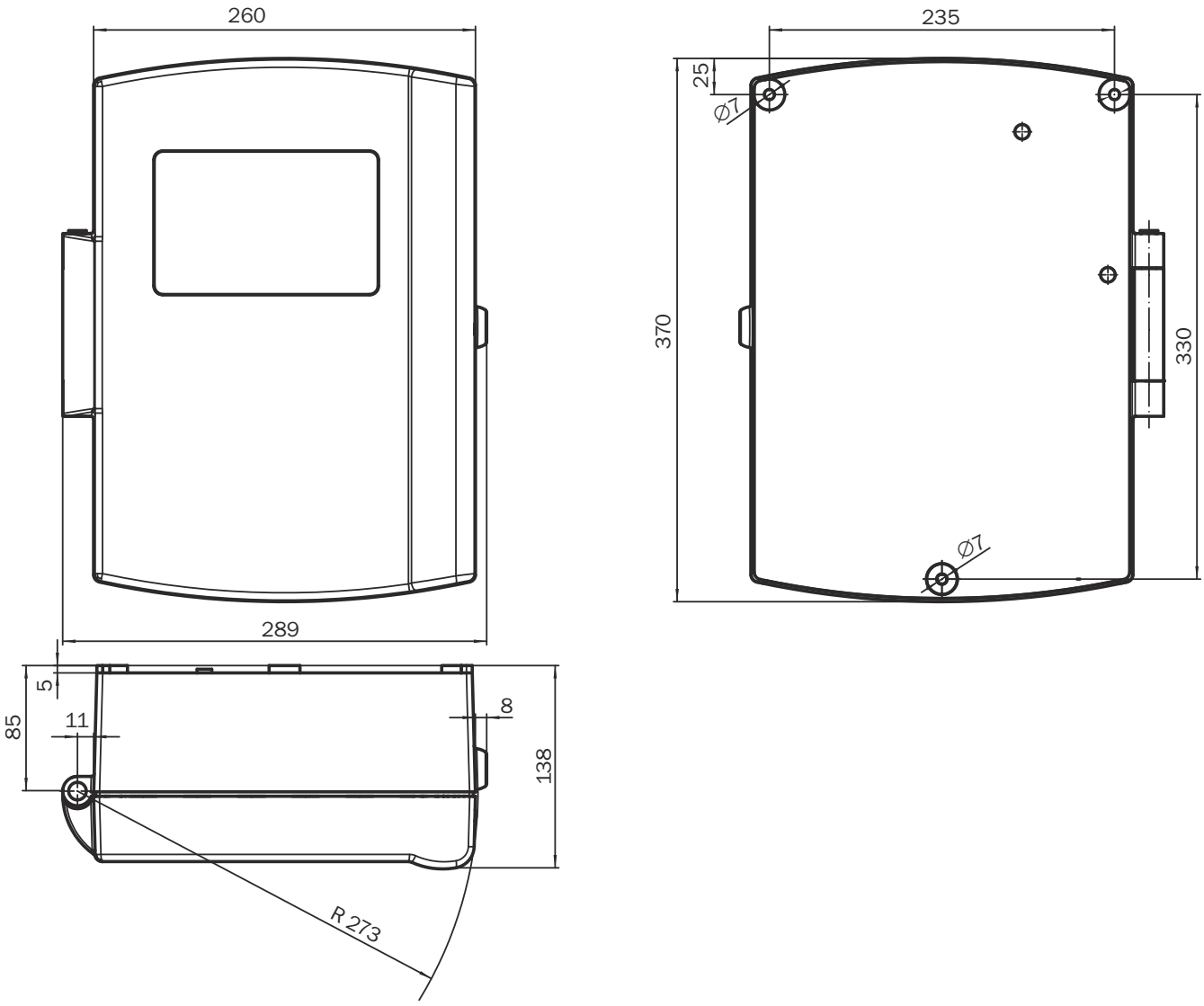
Subject to change without notice

9.7 GM700 evaluation unit, sheet metal enclosure version, dimensions



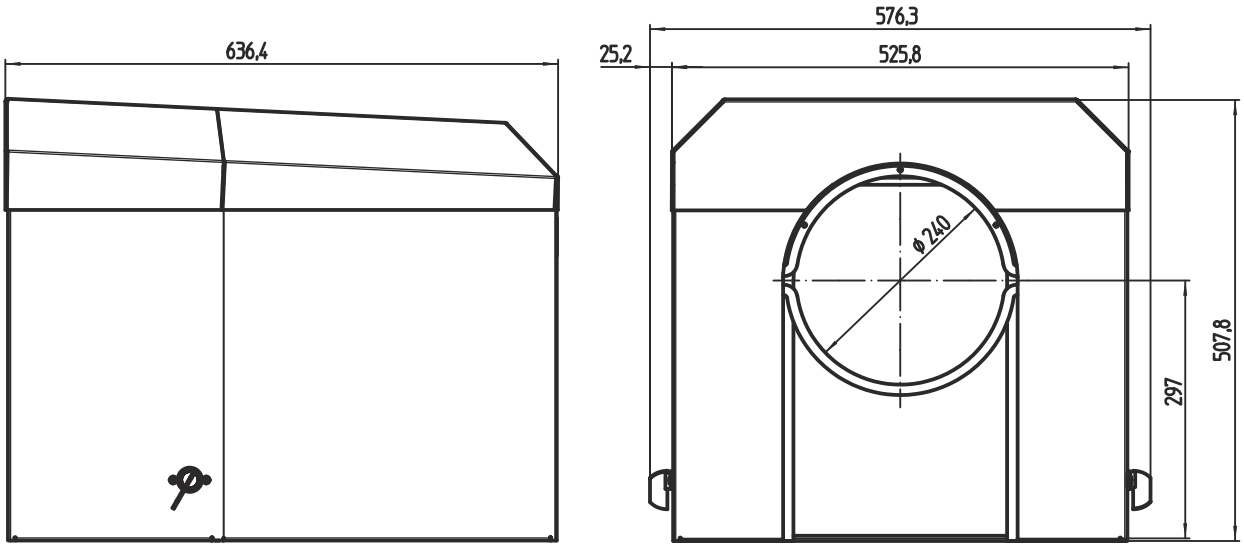
Subject to change without notice

9.8 GM700 evaluation unit, sheet metal version, dimensions

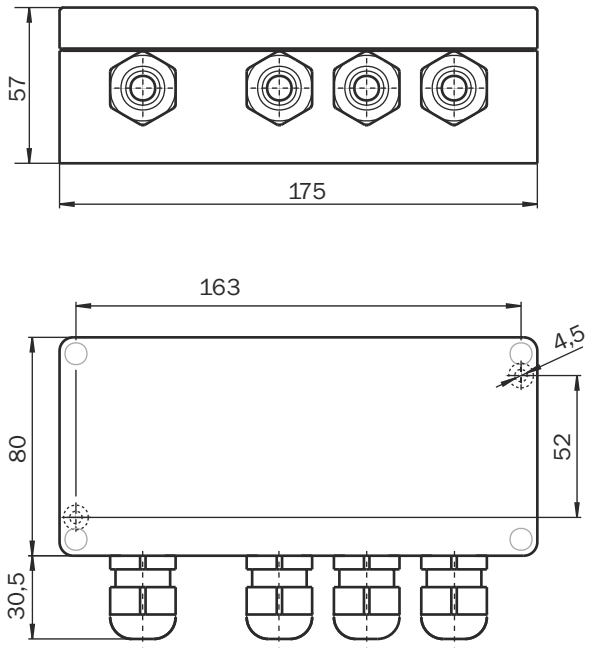


Subject to change without notice

9.9 Weatherproof cover for GM700 SR-unit and reflector unit



9.10 Terminal box dimensions for CAN bus (option); Part No. 2020440



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9.11 Accessories, expendable and spare parts

Please contact your local sales partner for order data for further spare parts as well as prices and packing units.

9.11.1 Consumable parts for 2-years operation

Part No.	Description
4 003 353	Optical cleaning cloth
6 010 378	Lithium battery 3.00 V CR2032
5 312 881	Pressure compensation element

9.11.2 Spare parts for the sender/receiver unit

Description	Part No, for measuring components			
	O_2	NH_3	HF	HCl
Spare parts set, laser diode, sender unit	2034526	2055984	2034777	2043533
Spare parts set, receiver module, measuring channel	2034524	2055986	2034775	2043537
Spare parts set, receiver module				
• Monitor channel	2034525	2055985	2034776	2043535
• Reference channel	2043570	2055985	2034776	2043535
Spare parts set, PCB heater	2034523	2055983	2030735	2043541
Spare parts set, PCB processor	2034541	2030737	2034778	2042707
Spare parts set, optics body module	2034522	2030720	2034774	2043540
Spare parts set, reference cuvette:				
• Purge cuvette	–	–	2034779	2043542
• Permanent cuvette	2034545	2030717	2043571	2042905
Spare parts set, alignment tool	2034780			2043538
Spare parts set, fiber optics with threaded sleeve	2030791			–
Spare parts set, insulation (optic body)	2030738		–	–
Spare parts set, PCB CAN cable connector (socket)	2030740			
Spare parts set, PCB CAN cable connector (plug)	2030739			
Spare parts set, flange mounting kit	2039628			
Spare parts set, lever (for alignment tool)	2030742			
Spare parts set, clamping ring bolt	2030741			
Bulkhead fitting 1/8"	5306073			

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9.11.3 Spare parts for the reflector unit

Description	Measuring components			
	O_2	NH_3	HF	HCl
Spare parts set, optics holder with wedge	2064516	2039629		
Spare parts set, reflector triple	2039630			

9.11.4 Spare parts for process window and flange

Part No.	Description
2 064 174	Sigraflex gasket for flange DN50 PN16
2 064 175	Sigraflex gasket for ANSI flange 2“ 150 LB
2 064 176	Graphite gasket D65/60*2, between window- and purge module

NOTICE: In case of a window damage the entire module must be replaced

Part No.	Description
2 062 473	Window module DN50 PN16
2 062 475	Window module ANSI

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9.11.5 Spare parts for the evaluation unit

Part No.	Description
2 021 795	PCB system control
6 021 782	Fuse 250 V, D8.5 x 8
6 020 125	Locking cap, fuse D5 x 20
6 007 328	Jumper, pluggable
6 020 400	Membrane keyboard
2 017 329	Hinge pin
6 010 378	Lithium battery 3.00 V CR2032

9.11.6 Fixing accessories

Fixing accessories for purge air fixture - flange

Part No.	Description
5 700 457	Screw, 6 Kt M16x60-A2
5 700 482	Washer, A17-A2
5 700 471	Nut, 6 Kt M16 A2
5 700 480	Spring washer, A16

Fixing accessories for SR-unit

Part No.	Description
5 700 484	Cup springs A25
5 700 472	Nut SSI M12
5 700 494	Spherical washer
2 017 329	Hinge pin for GM700 flange fixture
4 023 743	Sealing tape

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9.11.7 Spare parts assignment for sender/receiver unit

Fig. 46 Spare parts assignment for GM700 SR-unit

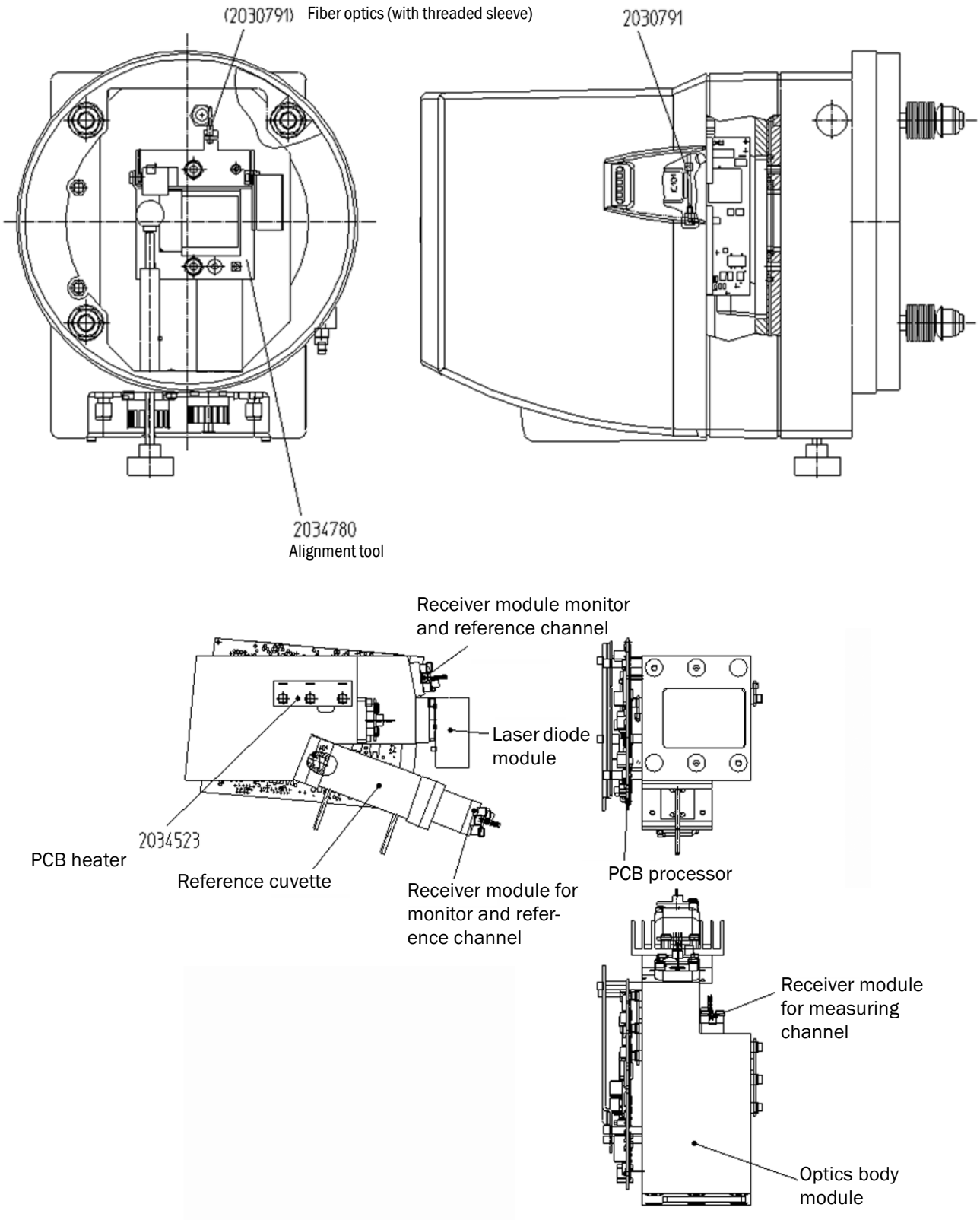

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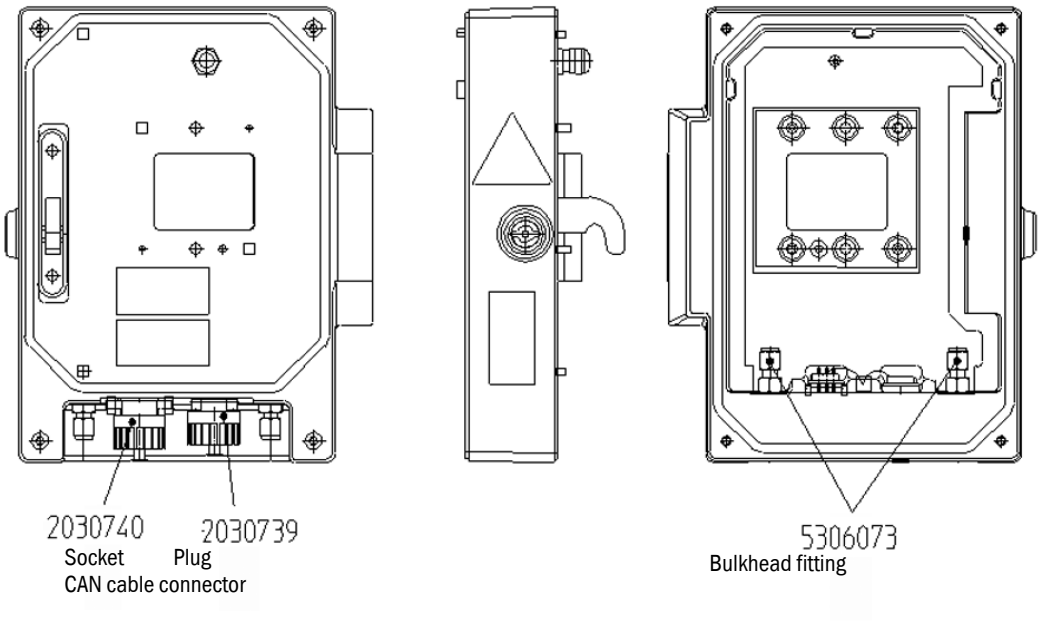
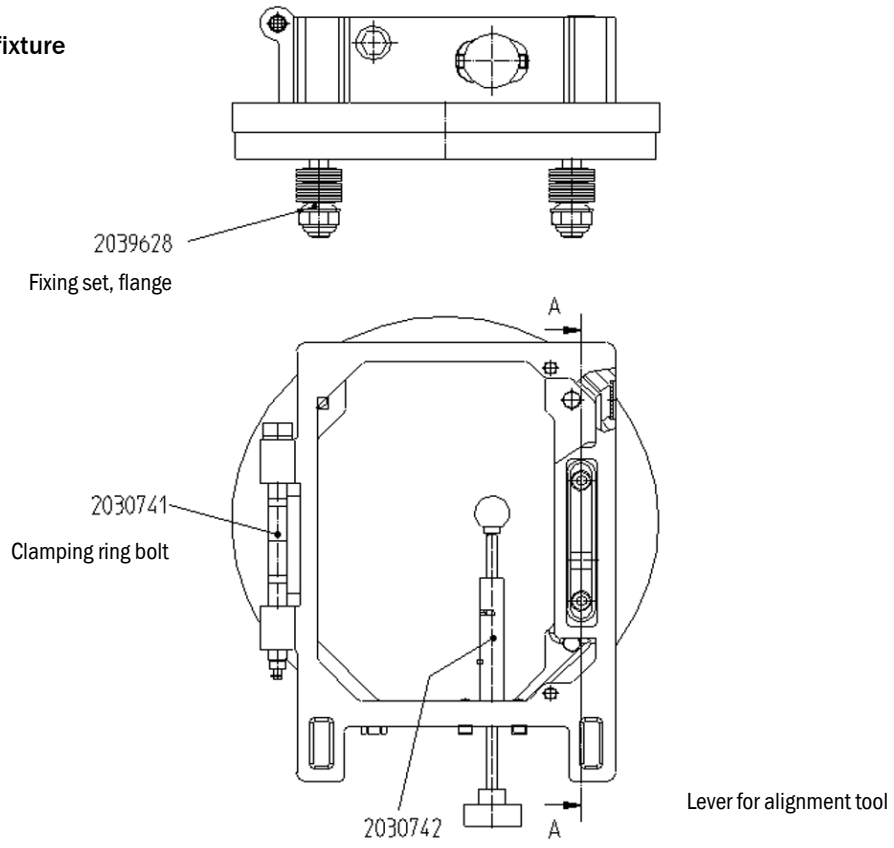
Fig. 47 Spare parts assignment for GM700 SR-unit - intermediate enclosure and flange fixture

SR-unit – intermediate enclosure



SR-unit:
Flange fixture



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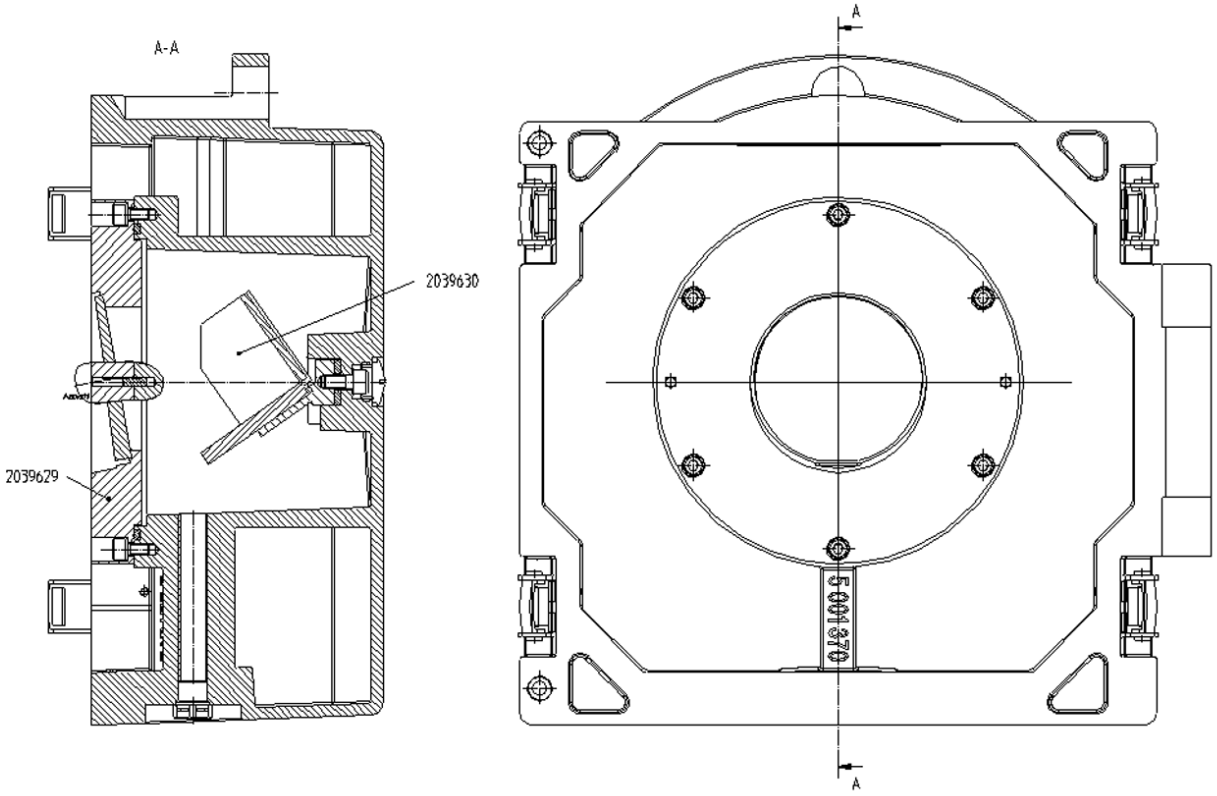
Spare parts assignment for reflector



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